OCTOBER 18, 1954

What Are Manufacturers Offering? —
See Catalogs and Bulletins on page 216

Electrical World

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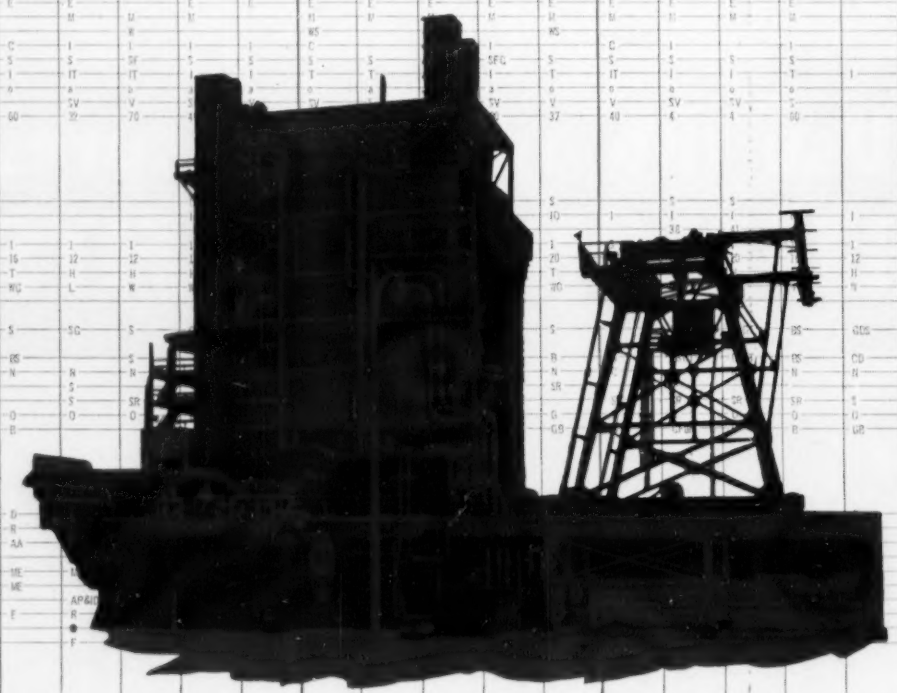

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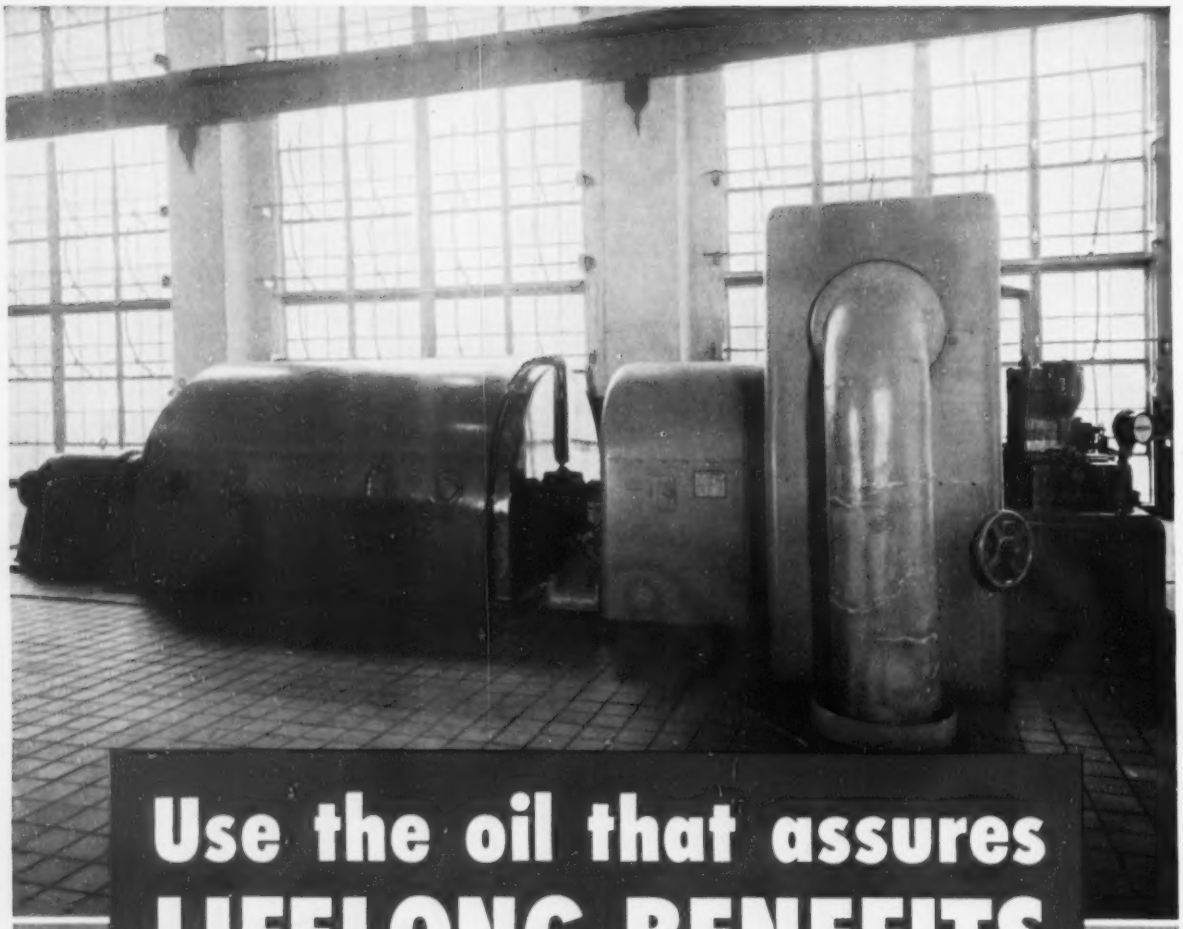

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FOR ALL TURBINES

Electrical World

Vol. 142 No. 16 October 18, 1954

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ELECTRICAL WORLD

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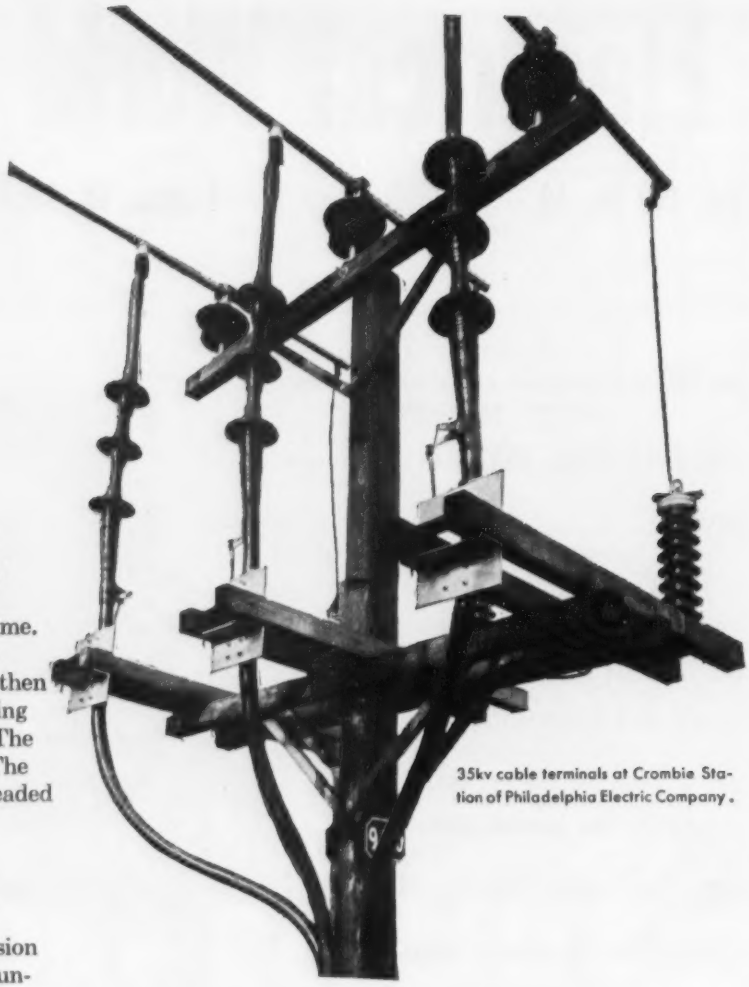

35kv cable terminals at Crombie Station of Philadelphia Electric Company.

Light-weight Okolite-Okoprene non-leaded, rubber-insulated cables enabled the Philadelphia Electric Company to construct these terminations in record time. The single-conductor, 35kv riser cables were measured for termination length, then the insulators, stress cones and grounding straps were assembled on the ground. The cables were then raised into position. The elimination of potheads on these non-leaded cables permitted this time-saving construction technique.

Okolite-Okoprene cables combine the economies and high factors of safety required for modern, efficient transmission of electric power. Okolite-Okoprene is unaffected by moisture, heat, ozone, corrosion and is highly resistant to mechanical damage. By using rubber instead of oil-impregnated paper insulated cable for this 35kv circuit, oil-filled potheads and oil reservoirs are eliminated. As a result, there is no oil to migrate at high temperatures or due to differences in elevation. For these reasons, and because of the light weight and ease of installation, the trend is to Okolite-Okoprene for handling high voltages up to 35,000 volts. Write for Bulletin EW-1075 for complete engineering information, dimensional data and splicing and terminating techniques for rubber-insulated, high-voltage cables. The Okonite Company, Passaic, N. J.

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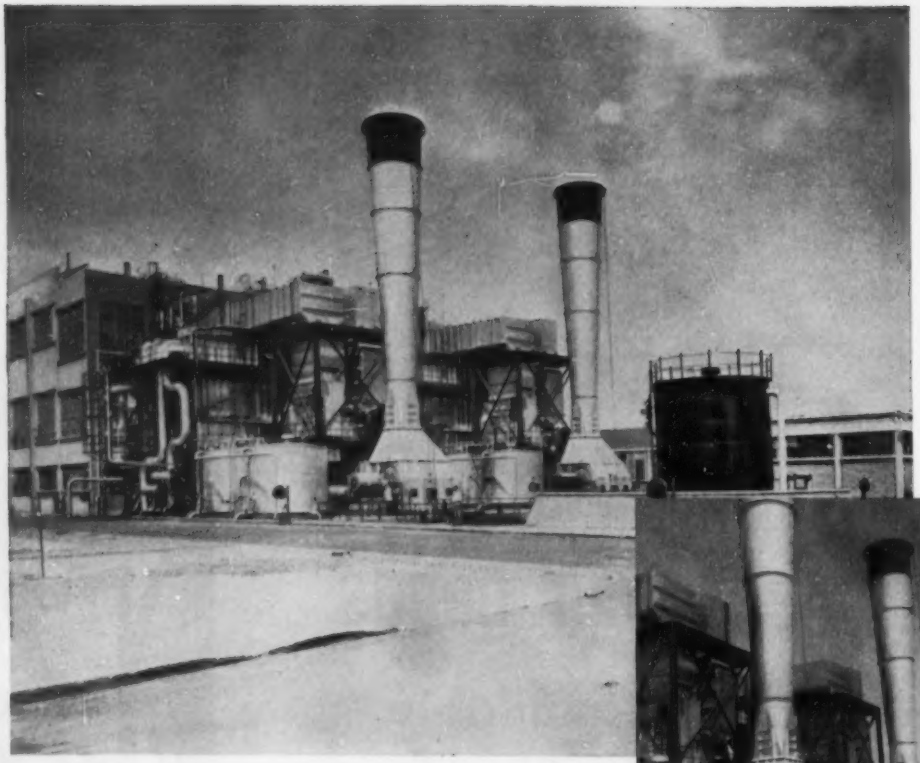
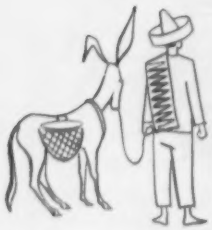
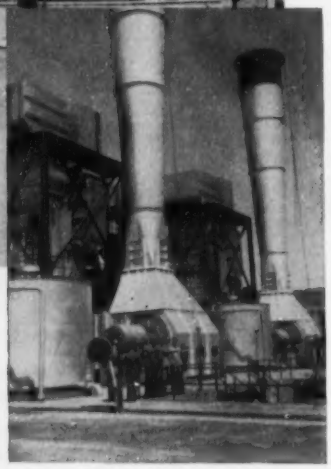
IN OVER 110 PRINCIPAL CITIES

The Lecheria Steam Plant of the Mexican Light & Power Co.







Close-up of the two P-D Fan Stacks at the Lecheria Plant.

pd FAN STACKS

Have a part in the Industrial Progress of Mexico

The Lecheria Steam Plant, operated by the Mexican Light & Power Company—largest electric utility in Mexico—supplies part of the power needed for the industrial growth of the country. Present capacity of the Lecheria Plant is 66,000 kw supplied by two single flow turbines; future expansion plans provide for installation of two additional units of similar or larger capacity.

Aiding the over-all efficiency of the Lecheria Plant are two venturi type P-D Fan Stacks. Each stack incorporates all components (Induced-Draft fan, breeching and stack) required for highly efficient induced draft.

Throughout the world, thousands of P-D Stacks stand as symbols of power—power for the home, power for industry—each a self-contained, well integrated unit designed to complement the modern power plant.

The Thermix Corporation, Project Engineers for Prat-Daniel, offer you a single source of *unit responsibility* . . . and years of specialized experience in solving the most difficult draft problems. Contact them for assistance and ask for data sheets on Prat-Daniel equipment.

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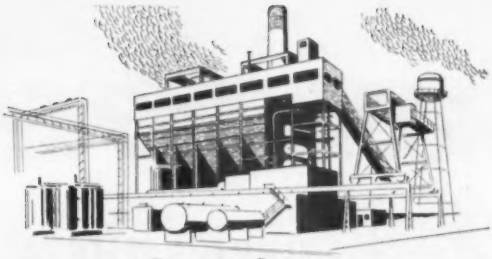
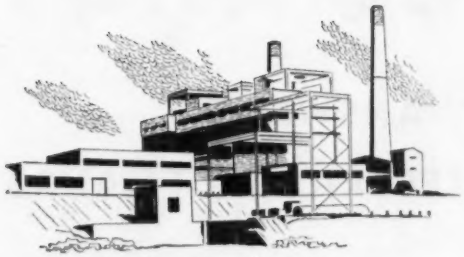


GOLDSBORO STATION
Total capability 169,000 kw.



LUMBERTON STATION
Total capability 185,000 kw.

WILMINGTON STATION
Total capability 230,000 kw. (est.)

Grinnell piping products have played a vital role in the construction of

7 NEW UNITS IN 7 YEARS

for Carolina Power & Light Company

HERE IS THE RECORD!
(Completion dates)
1949 . . . Lumberton Station, Unit #1
1950 . . . Lumberton Station, Unit #2
1951 . . . Goldsboro Station, Unit #2
1952 . . . Goldsboro Station, Unit #1
1952 . . . Lumberton Station, Unit #3
1954 . . . Wilmington Station, Unit #1
(Scheduled completion date)
1955 . . . Wilmington Station, Unit #2

Main steam line in WILMINGTON plant, fabricated by Grinnell, and supported by Grinnell Model R Constant-Support Hangers.

Since 1949, Carolina Power & Light's modernization and improvement program has been in full swing. Over this 6-year period, 6 new steam-electric generating units have been added to the system, with another scheduled for completion early in 1955. And very significantly, in each of these seven new units, Grinnell Prefabricated Piping and Grinnell Engineered Hangers have been employed, *exclusively!*

This continuous use of Grinnell Piping Products over the years means that Grinnell has successfully passed the most exacting test of all . . . the "test" of actual performance . . . on the job . . . day-in and day-out.

Piping fabricated in Grinnell shops is done under ideal conditions, with modern equipment, by personnel qualified for each class of work. Included in the price (which is determined in advance) are such items of expense as: interpretive engineering, shop sketches and planning, procurement of materials, power services, expendable tools and supplies. There are no charges for waste material or spoilage. All piping is rigidly inspected and tested to comply exactly with customer specifications and applicable codes. Consult Grinnell on your next piping job.

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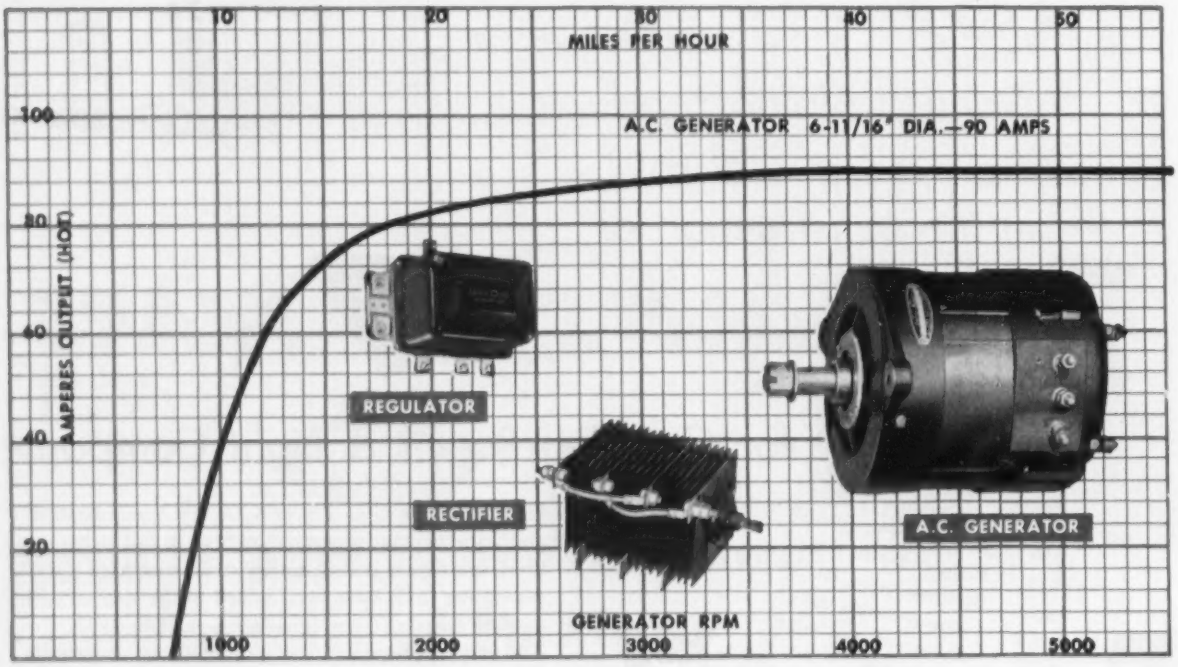
Power Packed and

HERE'S THE A.C. ANSWER TO EXTRA-HEAVY ELECTRICAL DEMANDS



DELCO-REMY

A. C. Generator, Regulator and Rectifier

Here's the answer for "problem" vehicles—Delco-Remy's new long-lived A.C.-D.C. charging system! It's specifically designed to meet the *extra*-heavy electrical demands of public utility trucks and other vehicles equipped with two-way radio, floodlights or any extra electrical units . . . ample current reserve picks up discharged battery quickly in operation. Delco-Remy A.C. generators are suitable for use at all engine speeds.

With output ranging from 30-40 amperes at curb idle and up to 90 amperes at higher engine speeds, the new Delco-Remy A.C.-D.C. charging system meets all electrical needs under the toughest operating conditions. Included in the new system is the A.C. generator, a matching regulator, and a rugged, dependable dry-plate rectifier which converts generator A.C. output to direct current.

Application packages complete with installation instruction sheets for popular makes of cars and trucks are now available. The conversion job is simple. For further details and application data, see your nearest United Motors distributor.

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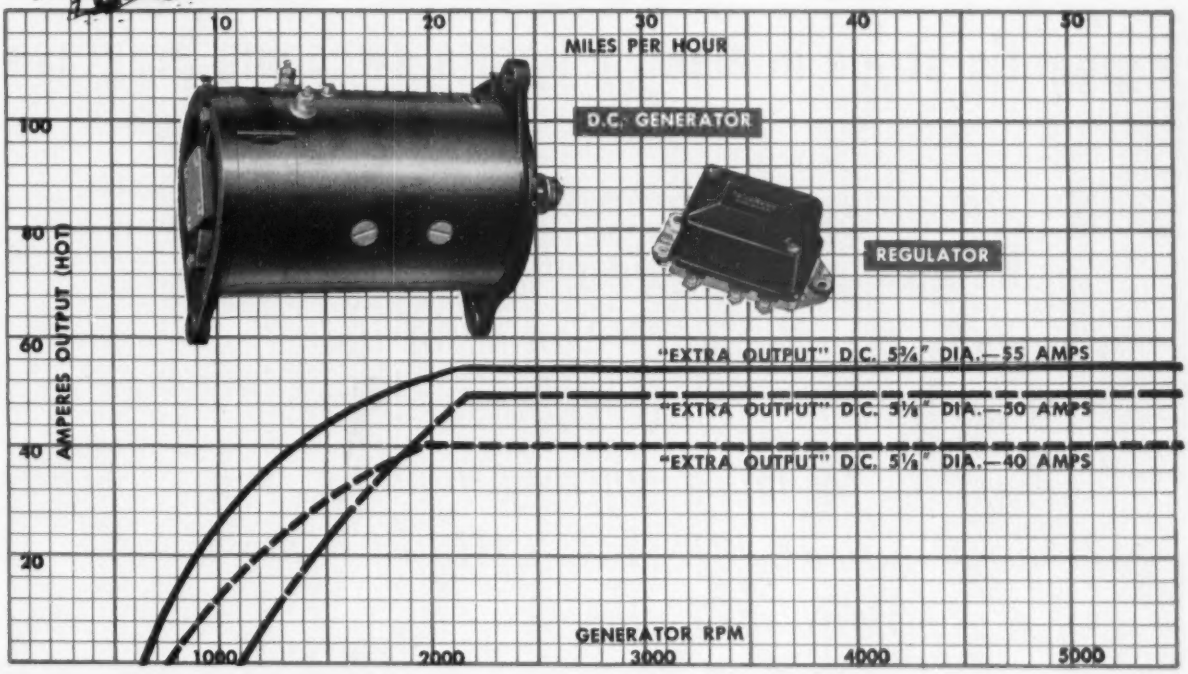
WHEREVER WHEELS TURN OR PROPELLERS SPIN

Right for the Job

HERE'S THE D.C. ANSWER TO HEAVY ELECTRICAL DEMANDS



DELCO-REMY

Extra-Output D. C. Generators and Matching Regulators

Delco-Remy extra-output D.C. generators are an economical answer to the electrical needs of public utility pickup or panel trucks as well as other vehicles with additional lights, two-way radios, or other special electrical equipment in medium to heavy-duty service. Delco-Remy extra-output D.C. generators are low in cost, simple to install, economical to maintain.

DELCO-REMY 40-AMP GENERATOR has low cut-in, about 7 mph, charges from 11 to 17 amperes at curb idle . . . full output about 18 mph —for vehicles customarily used in heavy traffic.

DELCO-REMY 50-AMP GENERATOR has slightly higher cut-in, about 11 mph . . . full output about 21 mph—for vehicles customarily operated at higher speeds, with minimum slow driving.

DELCO-REMY 55-AMP GENERATOR has very low cut-in, about 6 mph; charges at curb idle from 20 to 30 amperes . . . attains full output at 20 to 25 mph—for vehicles customarily operated at low speeds with added electrical loads, such as city taxicabs and police cars.

For further details and application data, see your nearest United Motors distributor.

Delco-Remy

DIVISION, GENERAL MOTORS CORPORATION, ANDERSON, INDIANA

WHEREVER WHEELS TURN OR PROPELLERS SPIN

Original Sunbury Steam Electric Station, built by Thomas A. Edison in 1883.

from Edison's tiny Sunbury

of 1883 to

SUNBURY TODAY

a gigantic stride in electric light's sweeping progress

In providing only the most efficient steam generating equipment for the modern Sunbury Steam Electric Station of the Pennsylvania Power & Light Company, as well as for many other outstanding central stations, FOSTER WHEELER has made a significant contribution to

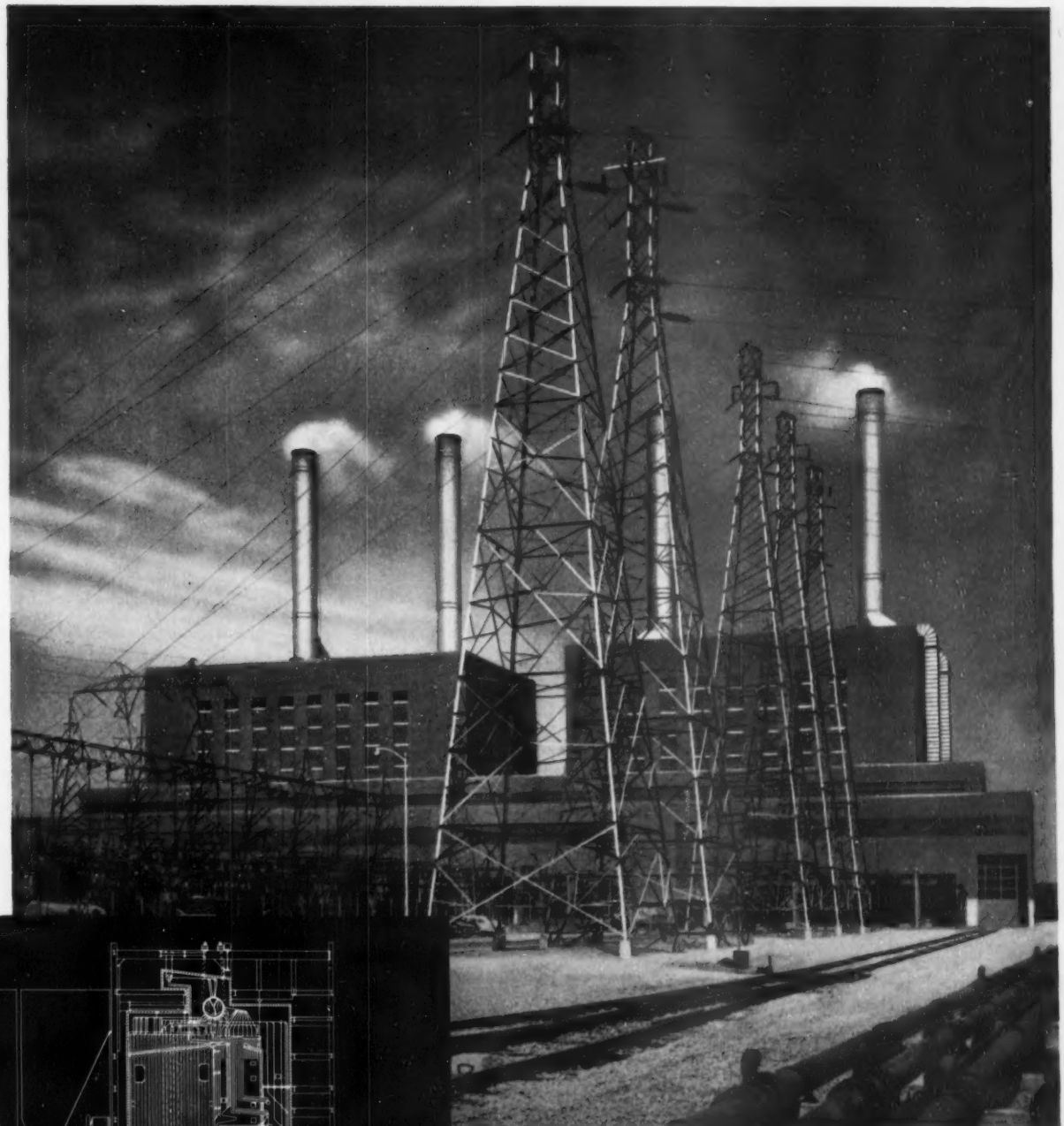
LIGHT FOR FREEDOM POWER FOR PROGRESS

When on July 4, 1883 Thomas Alva Edison closed the switch of the first three wire steam-electric station at Fourth and Vine Streets, Sunbury, Pa., the great inventor was initiating the public use of electric service. The sweeping progress that electric lighting was destined to accomplish in the years that followed is a tribute to Mr. Edison's genius and vision.

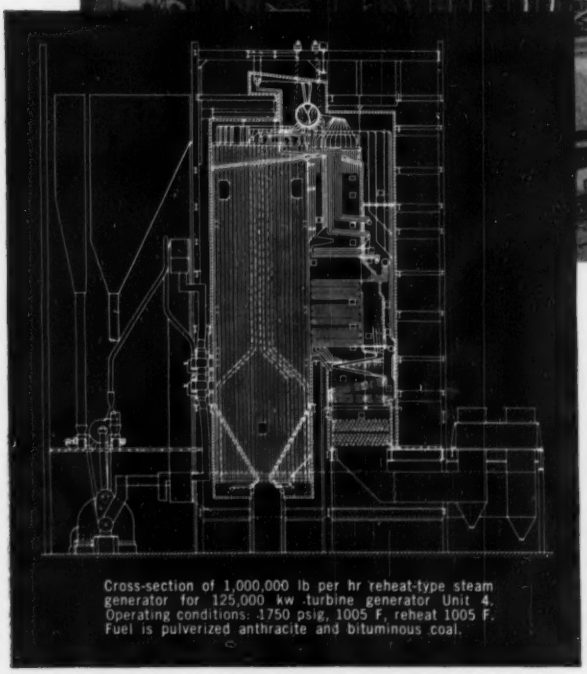
Today, located on the west bank of the Susquehanna, almost within view of the site of Edison's original building, stands its direct descendant – the mammoth Sunbury Steam Electric Station of the Pennsylvania Power & Light Company. A striking example of the industry's rapid development, this modern plant's output assists in serving the home, farm, factory and community needs throughout an area of 10,000 square miles in Central Eastern Pennsylvania.

Six Foster Wheeler Steam Generators now serve turbines No. 1, 2, 3 and 4 totaling 425,000 kw capacity. When ultimately completed, Sunbury will have a capacity of more than 800,000 kw. *Foster Wheeler Corporation, 165 Broadway, New York 6, New York.*

FOSTER WHEELER

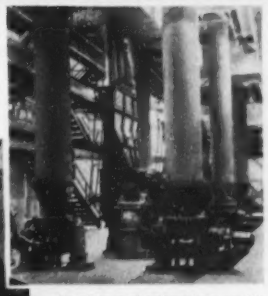


View, looking north, of the Sunbury Steam Electric Station of the Pennsylvania Power & Light Co., Sunbury, Pa. Ash disposal piping in foreground.



Cross-section of 1,000,000 lb per hr reheat-type steam generator for 125,000 kw turbine generator Unit 4. Operating conditions: 1750 psig, 1005 F, reheat 1005 F. Fuel is pulverized anthracite and bituminous coal.

One of the Foster Wheeler ball mills, that pulverizes a mixture of anthracite and bituminous coal at the rate of approximately 21 tons per hr. Classifier with preheated-air inlet duct is in foreground.



Feeders and exhausters on the firing floor at Sunbury. These feeders are of the rotating table type, regulating the flow of anthracite and bituminous coal to ball-mill pulverizers.

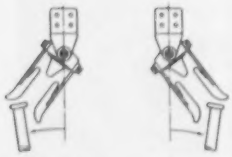
Another SPHC*

SEALED PRESSURE HINGE CONTACT

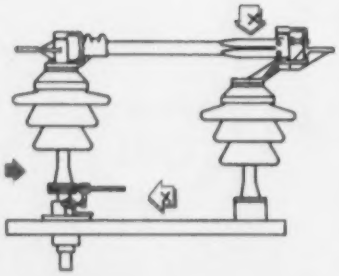
NOW ON HORIZONTAL BREAK SWITCHES

Featuring the highly desirable and successful R&IE *features that popularized the vertical break type TTR-49*

Check the Facts –



Reversible blade and jaw permit clockwise or counter-clockwise operation.



Note how ice-locking troubles are lessened by the wide clearances (X) provided at jaw assembly and under the crank.

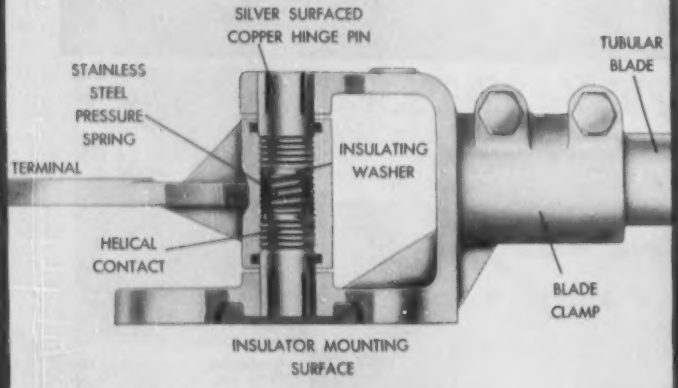
1 **HINGE**—Sealed Pressure Hinge Contacts used are identical in construction to those featured on vertical break type TTR49 switches. The "sealed in", helical type contact is used both at the blade hinge and at the jaw for opening and closing.

2 **JAW CONTACTS**—Hi-Pressure, Hi-Thermal capacity, silver-to-copper wiping contact. The construction is identical to that of the vertical break type TTR49. A combination of current carrying metals as shown below, indicates how each is especially suitable for its particular function.

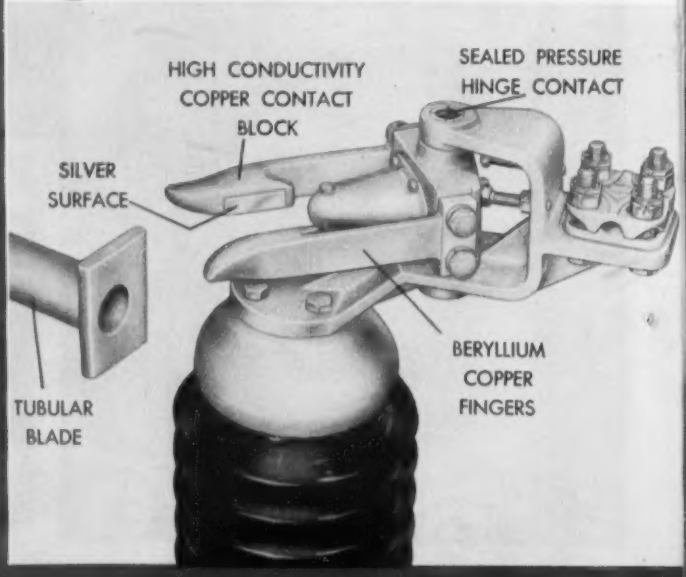
3 **TERMINALS**—Both at same elevation from base. Clamp type, with four half-inch bolts on 1¾ inch centers, especially suitable for R&IE type UC universal, or type TL clamps, or any NEMA standard 400, 600 or 1200 ampere clamping. Tinned surfaces can be provided for aluminum conductor.

4 **BLADE**—Extra heavy, tubular hard-drawn copper blade with brazed-on contact block which makes the best outdoor switch contact for all service conditions when engaged with the silver surface of the jaw.

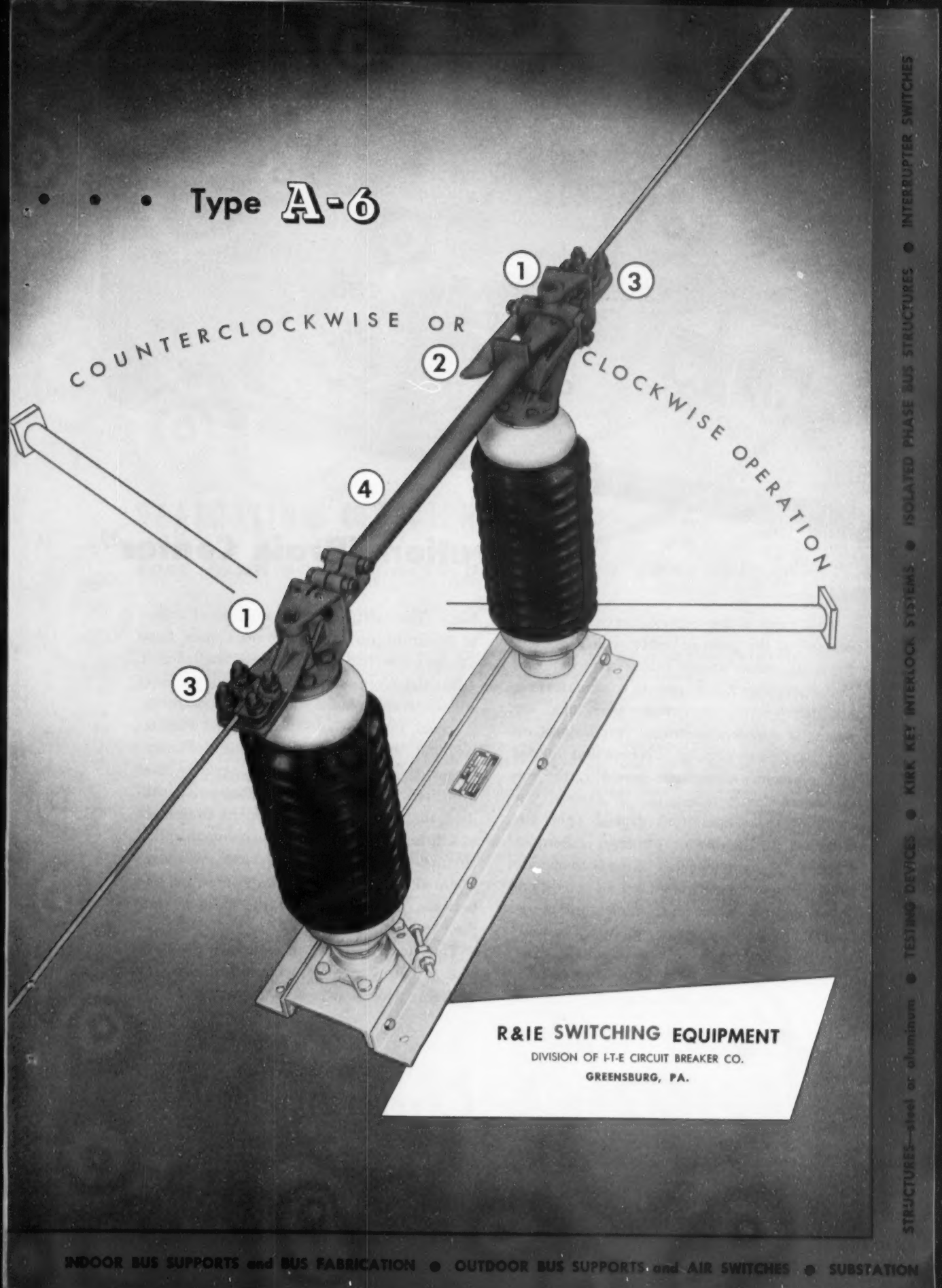
① *SEALED PRESSURE HINGE CONTACT



② SIDE SWING JAW CONTACT



FORTY-THREE YEARS OF PIONEERING FOR THE ELECTRICAL INDUSTRY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CLOCKWISE OPERATION
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DIVISION OF I-T-E CIRCUIT BREAKER CO.
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INDOOR BUS SUPPORTS and BUS FABRICATION • OUTDOOR BUS SUPPORTS and AIR SWITCHES • SUBSTATION STRUCTURES—steel or aluminum • TESTING DEVICES • KIRK KEY INTERLOCK SYSTEMS • ISOLATED PHASE BUS STRUCTURES • INTERRUPTER SWITCHES

Operation "Brain Center"

This room is the control, nerve, or "brain center" of the modern public utility system. From this room control cables carry impulses that operate switches, remote control devices, and telemetering equipment. Here men, by means of remotely-controlled switches, set up and break down circuits. It is here that failures of equipment and outages caused by the elements are circumvented.

All of these operations depend upon the sure and dependable performance of Simplex Control Cables. They must be ready to operate under every conceivable kind of condition. These control cables bear a measure of responsibility entirely out of proportion to their size. But they do it with absolute dependability. The safety of many millions of dollars of public utility equipment rests upon these slender cables and the equipment they control.

Simplex Control Cables are made in three styles: Anhydrex-insulated and neoprene-jacketed, Polyethylene-insulated and Plastex-jacketed, and Plastex-insulated and Plastex-jacketed. There is a size and a style to meet every operating condition on your public utility system, whether it be to operate equipment at a distance, for telephone and communication circuits, for telemetering devices. Whatever the need, be sure that the vital connecting link between the "brain" and the equipment is Simplex Control Cable.

Your local Simplex representative will be glad to help you with any problem you may be facing which has to do with cables.

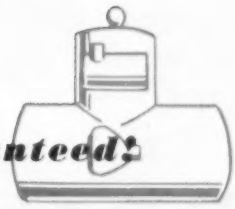
Simplex Control Cables

products of

SIMPLEX WIRE & CABLE CO., 79 Sidney Street, Cambridge 39, Mass.

DEAERATING EFFICIENCY

less than seven parts per billion guaranteed!



These are words. What you want is *PERFORMANCE.* Cochrane's unparalleled experience in years and number of installations with all types of deaerating equipment assures you that *guarantees will be met!* Check this statement with any Cochrane user.

Cochrane has the greatest number of deaerating heater installations of any manufacturer in the world. Manufacturing every type of deaerating heater and water conditioning equipment, Cochrane's *complete* service assures you unbiased recommendations for equipment to performance specifications. It assures undivided responsibility for engineering, fabrication and satisfactory continuing operation by a single company.

For further information on Cochrane Deaerators, write for Publication Nos. 3005, 4643 and 4635.

Other Cochrane Processes

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Cochrane ion exchange units deliver a continuous supply of demineralized silica-free water at extremely low cost. Pub. No. 5800.

HOT ZEOLITE

Replaces second stage phosphate treatment in hot-process softener. High temperature ion exchange resins completely remove residual hardness at great savings in soda ash and phosphate. Pub. No. 4801.

SOLIDS CONTACT REACTOR

Slurry blanket principle efficiently removes solids, turbidity, color, taste, silica, fluorides, and reduces alkalinity from water for industrial and municipal purposes. Pub. No. 5001-A.

COCHRANE CORPORATION · WATER ENGINEERS FOR 91 YEARS · 1863–1954

Cochrane

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Representatives in 30 principal cities in U. S.; Toronto, Canada; Mexico City, Mexico; Paris, France; Havana, Cuba; Caracas, Venezuela; San Juan, Puerto Rico; Honolulu, Hawaii.

Pottstown Metal Products Division—Custom built carbon steel and alloy products

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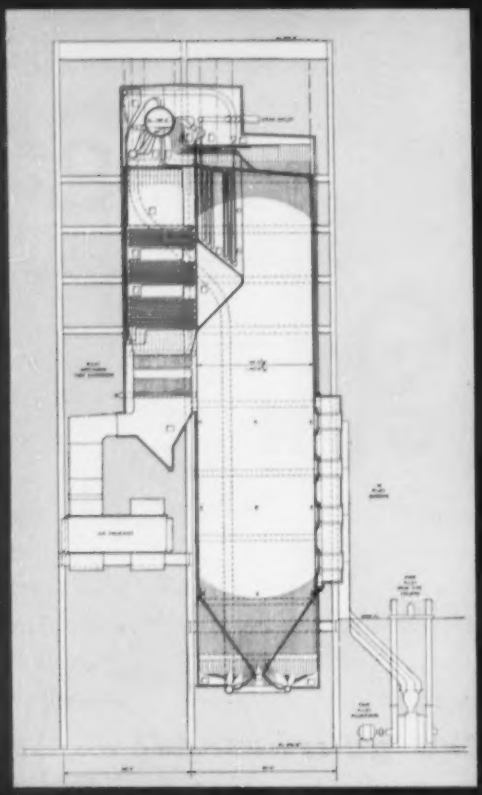
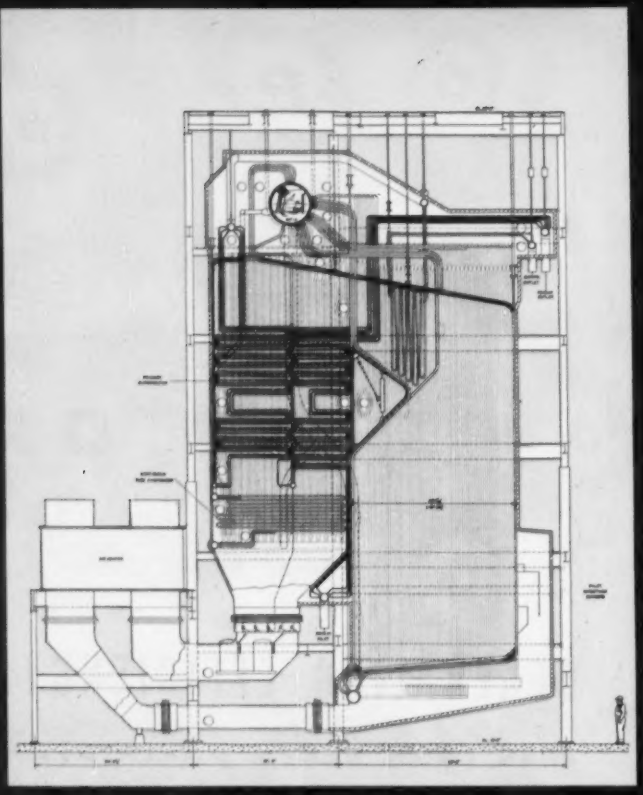
Demineralizers • Hot Process Softeners • Hot Zeolite Softeners • Dealkalizers • Reactors • Deaerators • Continuous Blow-Off • C-B Systems • Specialties



For Picway Steam Station
Columbus & Southern Ohio Electric Co.
900,000 lbs/hr; 1500 psig; 950 F; Eff. 86.5%

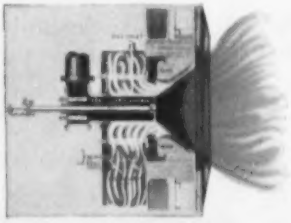


For Teche Power Station
Central Louisiana Electric Company
350,000 lbs/hr; 1650 psig; 1005F/1005F Reheat; Eff. 84.8%

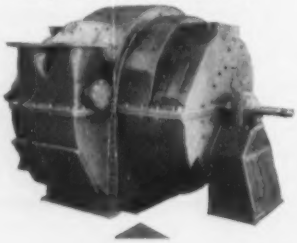
FUEL: OHIO STRIP MINE COAL

This unit was designed to operate under peaking load conditions with Ohio Strip Mine Coal having a moisture content of 16% and containing 10% ash, with Btu of 10,500 and fusion temperature of 2100 F. These coal specifications warranted a furnace with a heat release of 13,500 Btu per cu. ft. of volume, and 85,000 Btu per sq. ft. of projected envelope. The unit is fired by 16 Riley Flare Type Burners and four 15 ton-per-hour Riley #550 Duplex Pulverizers. Erosion resistant tungsten carbide faced pulverizing parts in the mills assure sustained high fineness and low maintenance cost over months of continuous operation. Commonwealth Associates, Engineers

Riley Flare Type Burner



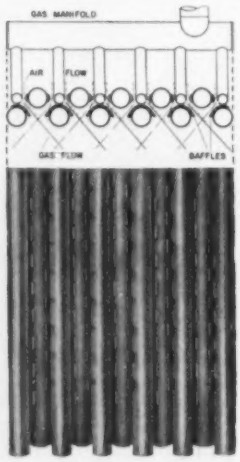
Riley #550 Duplex Pulverizer



FUEL: NATURAL GAS

This relatively small compact Riley pressurized unit will provide the economy of reheat to power a turbine with a nominal rating of 50,000 kw. New Riley Intertube Gas Burners for firing natural gas make possible low excess air, and eliminate exposed burner refractory. "Wall of Flame" characteristic of this new Riley burner provides unusual uniformity of heat distribution across furnace with uniform heat absorption across superheater. Superheat and reheat temperatures are maintained by a combination of spray for superheat and damper control for reheat. Sargent & Lundy, Engineers.

Riley Intertube Burner

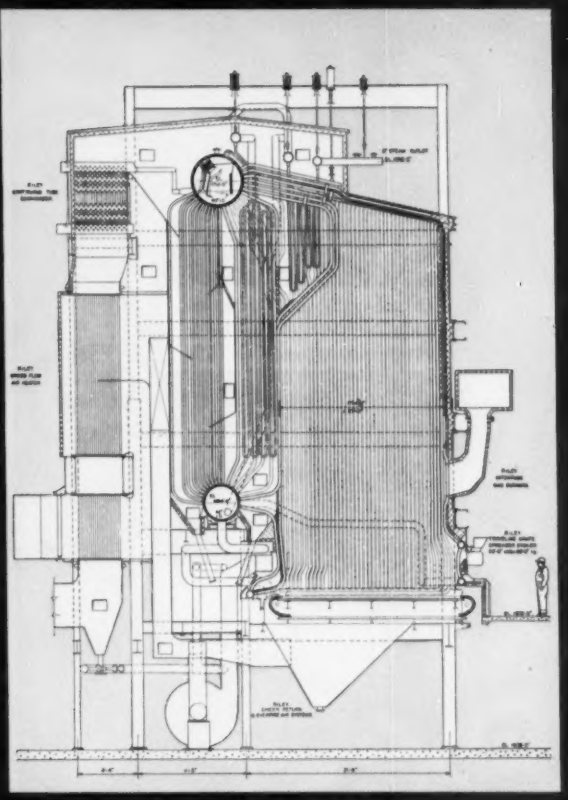


RILEY INTERTUBE GAS BURNERS
Notice absence of refractory. Front row of tubes are part of waterwall, and provides water-cooled protection to gas burners.

COMPLETE STEAM GENERATING UNITS AND FUEL BURNING EQUIPMENT

3 RILEY steam generating units

. . . selected for high yearly net efficiency, continuity of operation and dependability . . . three of the many Riley units recently purchased by leading public utility companies: In the past few years there has been a decided swing to Riley because of satisfactory performance of hundreds of existing Riley units.



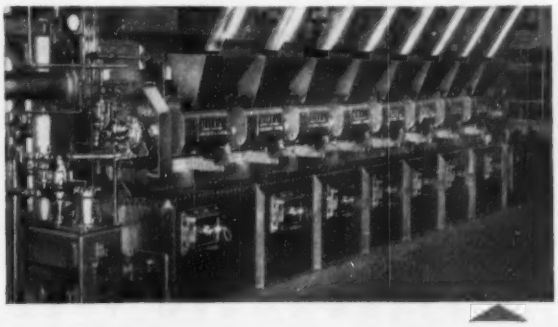
For R. M. Heskett Station
Montana-Dakota Utilities
250,000 lbs/hr; 1025 psig, 905F; Eff. 79.0%

FUEL: LIGNITE AND NATURAL GAS

This combination of a Riley Traveling Grate Spreader Stoker for burning lignite, and Riley Intertube Burners for natural gas, assures maximum performance whether fuels are burned singly or in combination.

Each method of firing provides even distribution of heat in furnace. There is no exposed refractory in the Riley Intertube Burners and they receive water-cooled protection when firing lignite. Specified steam temperature is maintained regardless of fuel used by Riley heat exchanger in lower drum. Unit also features a Riley single-pass, two-section Air Heater and a Riley Continuous Tube Economizer. Ebasco Services, Engineers.

Riley Traveling Grate Spreader Stoker



Here are a few other recent Riley sales to Public Utility Companies—

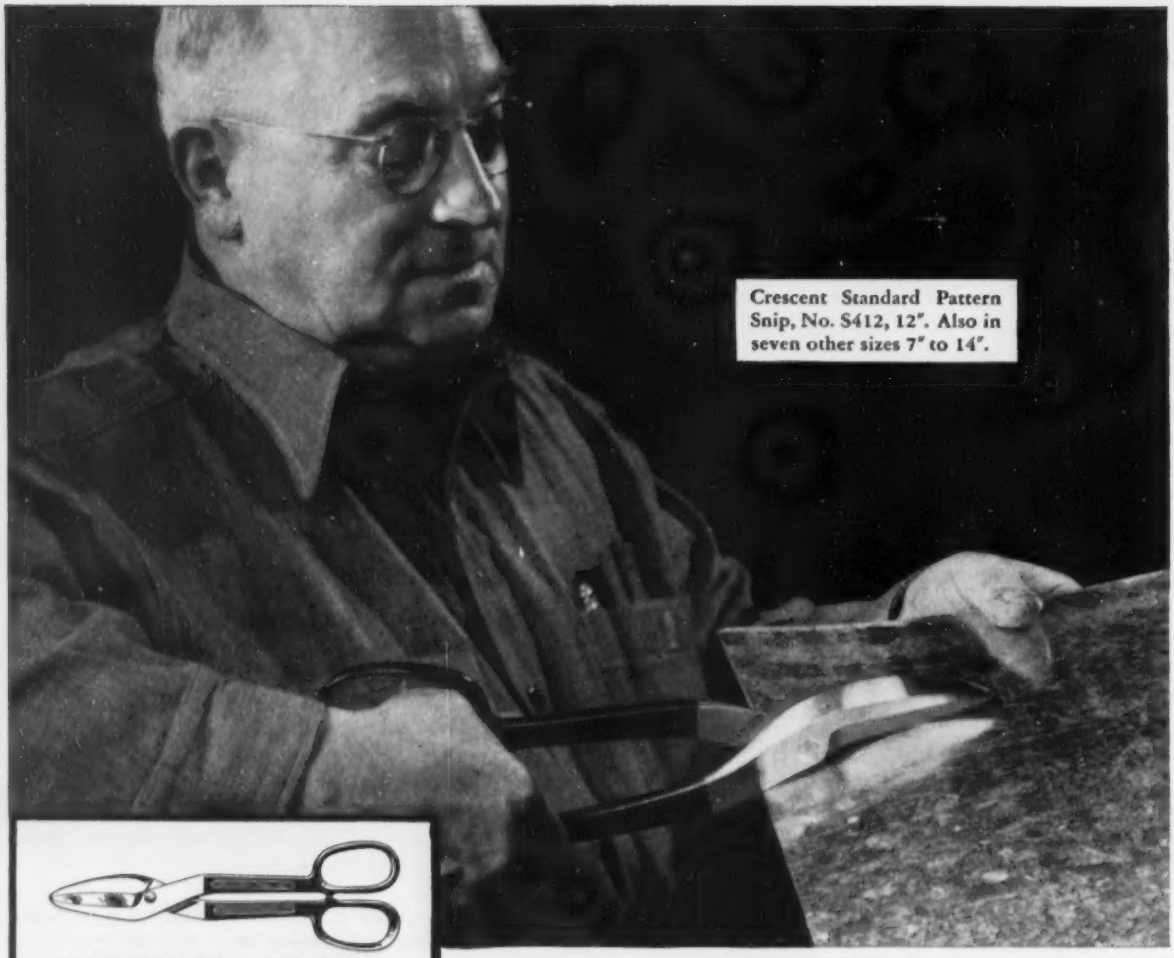
Louisiana Power & Light Co.	1-1,000,000 lbs/hr Reheat
New Orleans Public Service, Inc.	1-975,000 lbs/hr S.G.U.
Houston Lighting & Power Co.	2-1,250,000 lbs/hr Reheat
Texas Electric Service Co.	1-1,250,000 lbs/hr Reheat
City of Los Angeles	2-1,200,000 lbs/hr Reheat
Dallas Power & Light Co.	1-1,050,000 lbs/hr S.G.U.
Monongahela Power Co.— The Potomac Edison Co.	2-700,000 lbs/hr S.G.U.
Southwestern Gas & Electric Co.	1-630,000 lbs/hr S.G.U.
Taiwan Power Co., Taiwan	1-425,000 lbs/hr RX Unit
Florida Power Corporation	1-600,000 lbs/hr Reheat
Southern Nevada Power Co.	1-425,000 lbs/hr S.G.U.
Commonwealth Edison Co.	1-450,000 lbs/hr S.G.U.
Public Service Co. of Indiana, Inc.	1-805,000 lbs/hr Reheat
Iowa Electric Light & Power Co.	2-300,000 lbs/hr S.G.U.

A survey of your power plant will possibly show ways of making surprisingly large savings in your power costs.

RILEY
Stoker Corporation
WORCESTER, MASSACHUSETTS

Boston, New York, Philadelphia, Buffalo, Washington, Pittsburgh, Cleveland, Detroit, Chicago, Cincinnati, Charlotte, New Orleans, Atlanta, St. Louis, Kansas City, St. Paul, Tulsa, Houston, Denver, Salt Lake City, Los Angeles, San Francisco, Portland, Seattle.

FOR PUBLIC UTILITIES AND INDUSTRIAL POWER AND HEATING PLANTS



Crescent Standard Pattern Snip, No. S412, 12". Also in seven other sizes 7" to 14".

COMBINATION PATTERN
U412, 12" only.

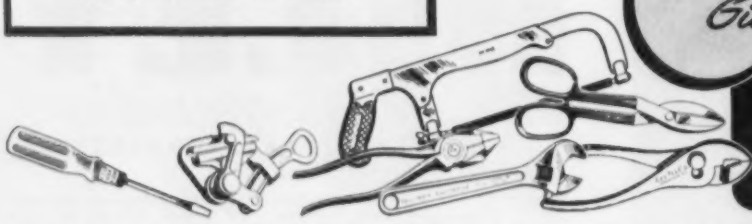
HEAVY DUTY SNIPS
U416, 16" only.

CIRCULAR CUTTING SNIPS
T412, 12". Also in 7" size.

CRESCENT SNIPS

All Crescent Snips are forged of selected steel and blades ground on special grinding machines. They are hardened by Crescent's own selective induction process to insure long, satisfactory service. These easy-cutting, well-balanced snips are made in four patterns; standard, circular cutting, combination and heavy duty. *Sold by Industrial Distributors and Hardware Dealers everywhere.*

CRESCENT TOOLS
Give Wings to Work
®
Sign of the Artisan
Symbol of Excellence



Crescent is our trade-mark, registered in the United States and abroad, for wrenches and other tools. Sold by leading distributors and retailers everywhere and made only by
CRESCENT TOOL COMPANY, JAMESTOWN, NEW YORK

General Motors

announces

a new development of unusual promise for

Electric Utility Companies

Electro-Mobile

for interim boosting in fringe

–in 3 versatile, fully

NINETY DOLLARS PER

ELECTRO-MOTIVE

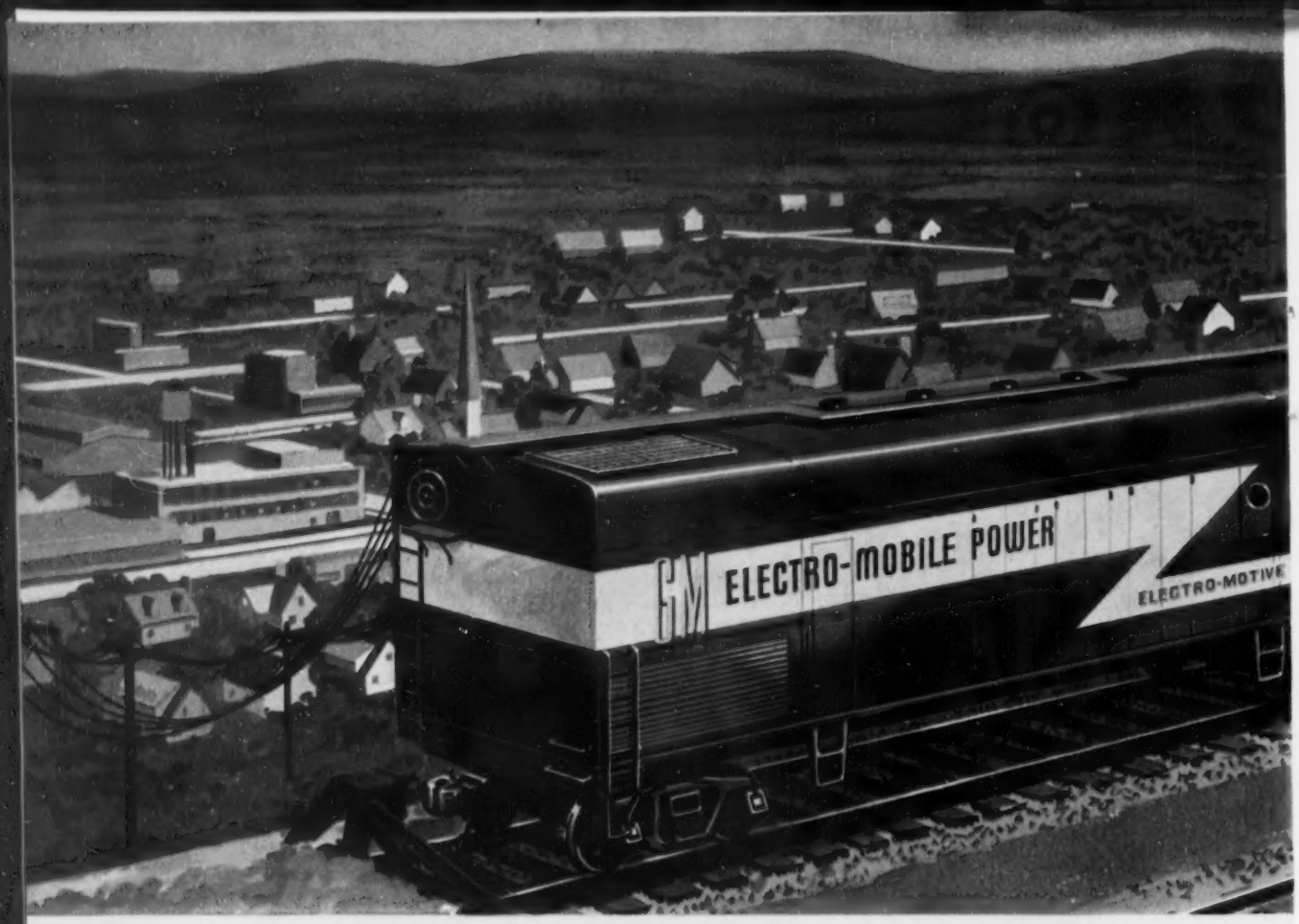
Power

areas and emergencies

integrated Diesel units-

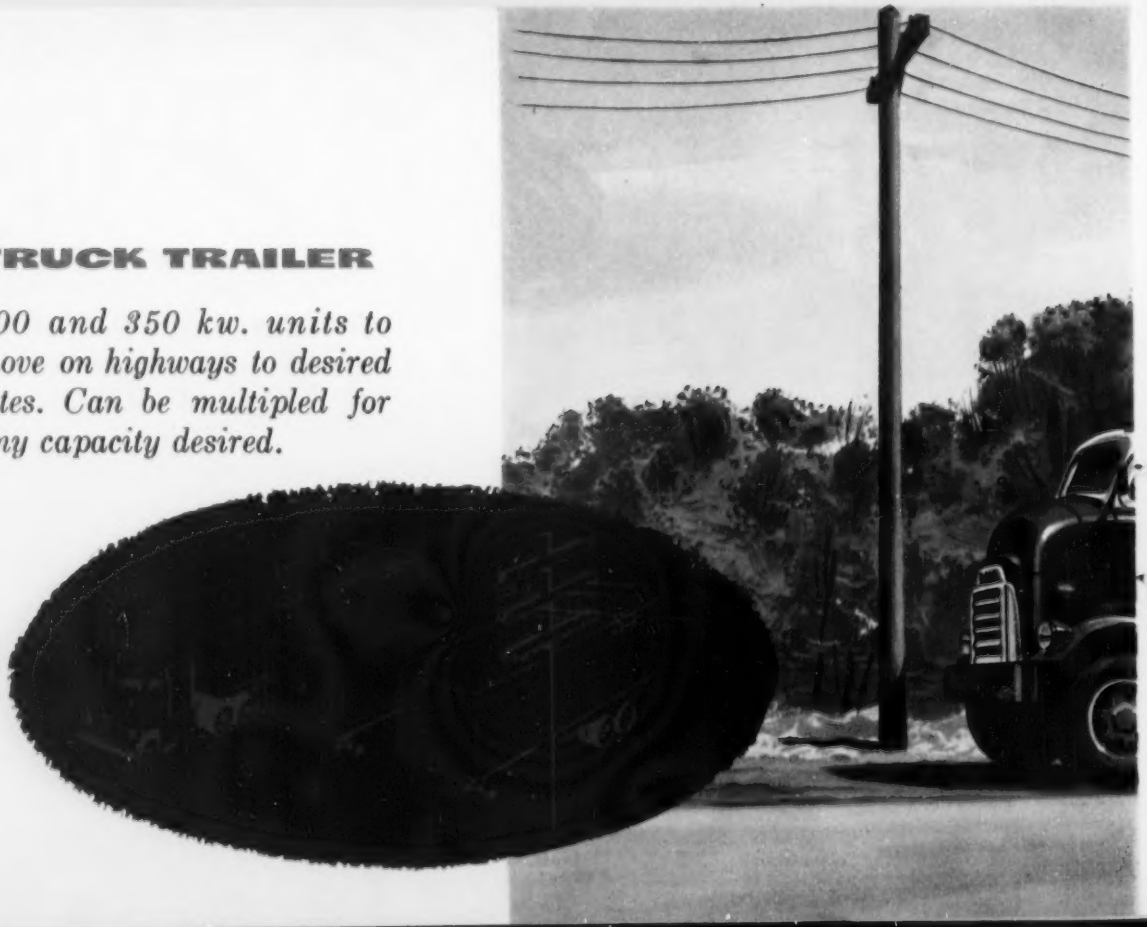
KW. *at point of application*

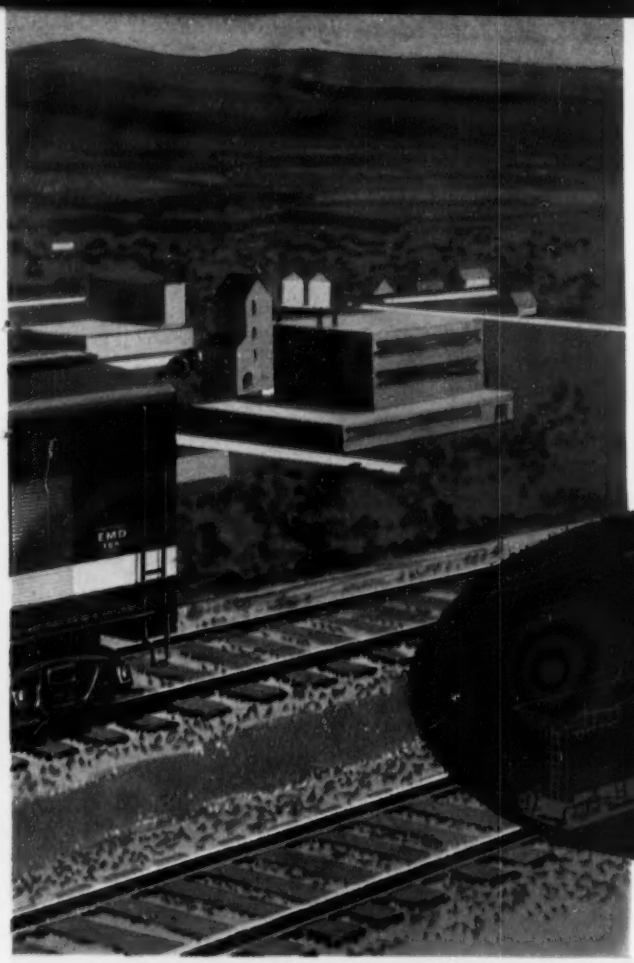
FOR A TYPICAL 1,000 kw. UNIT



2. TRUCK TRAILER

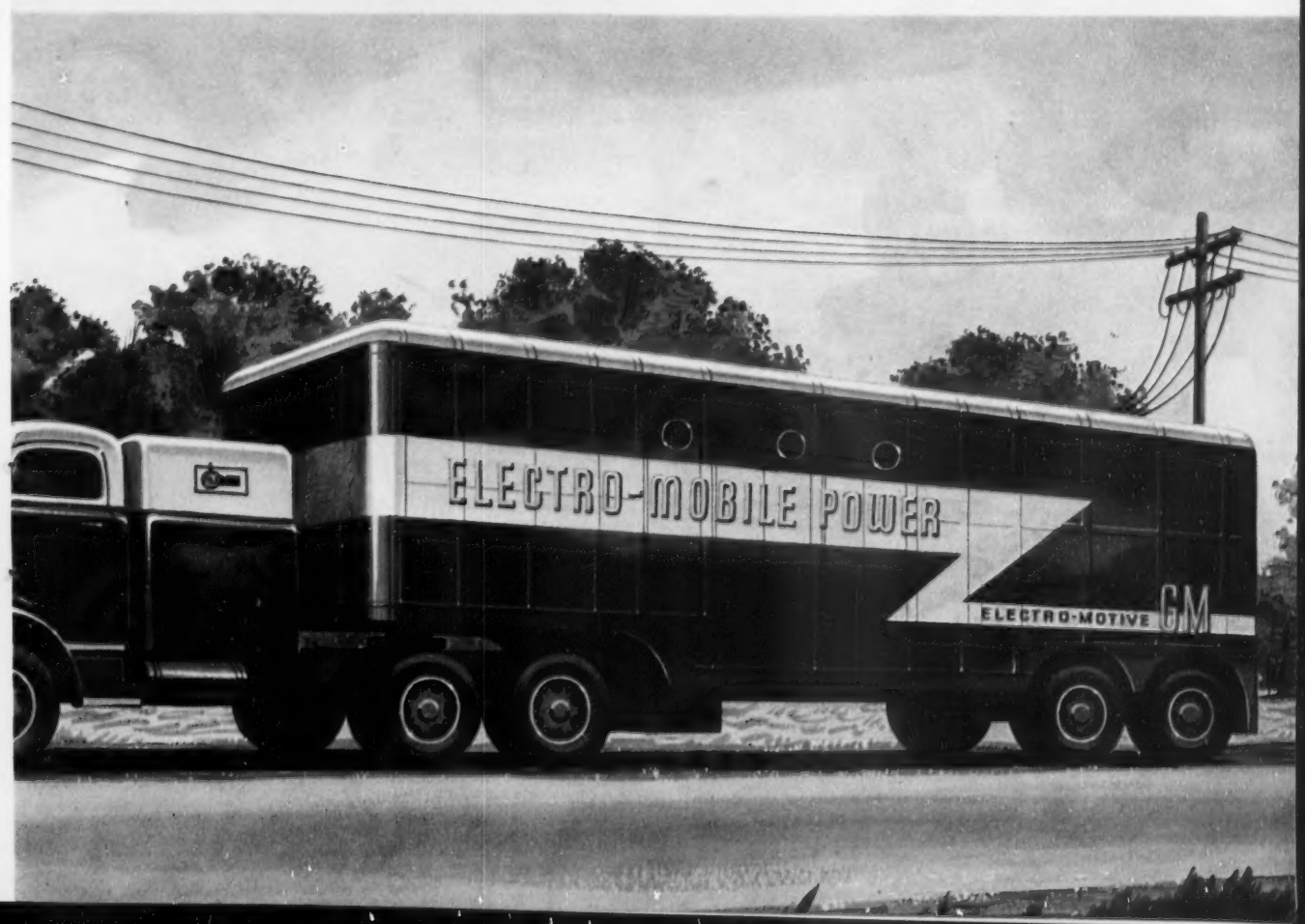
500 and 350 kw. units to move on highways to desired sites. Can be multipled for any capacity desired.

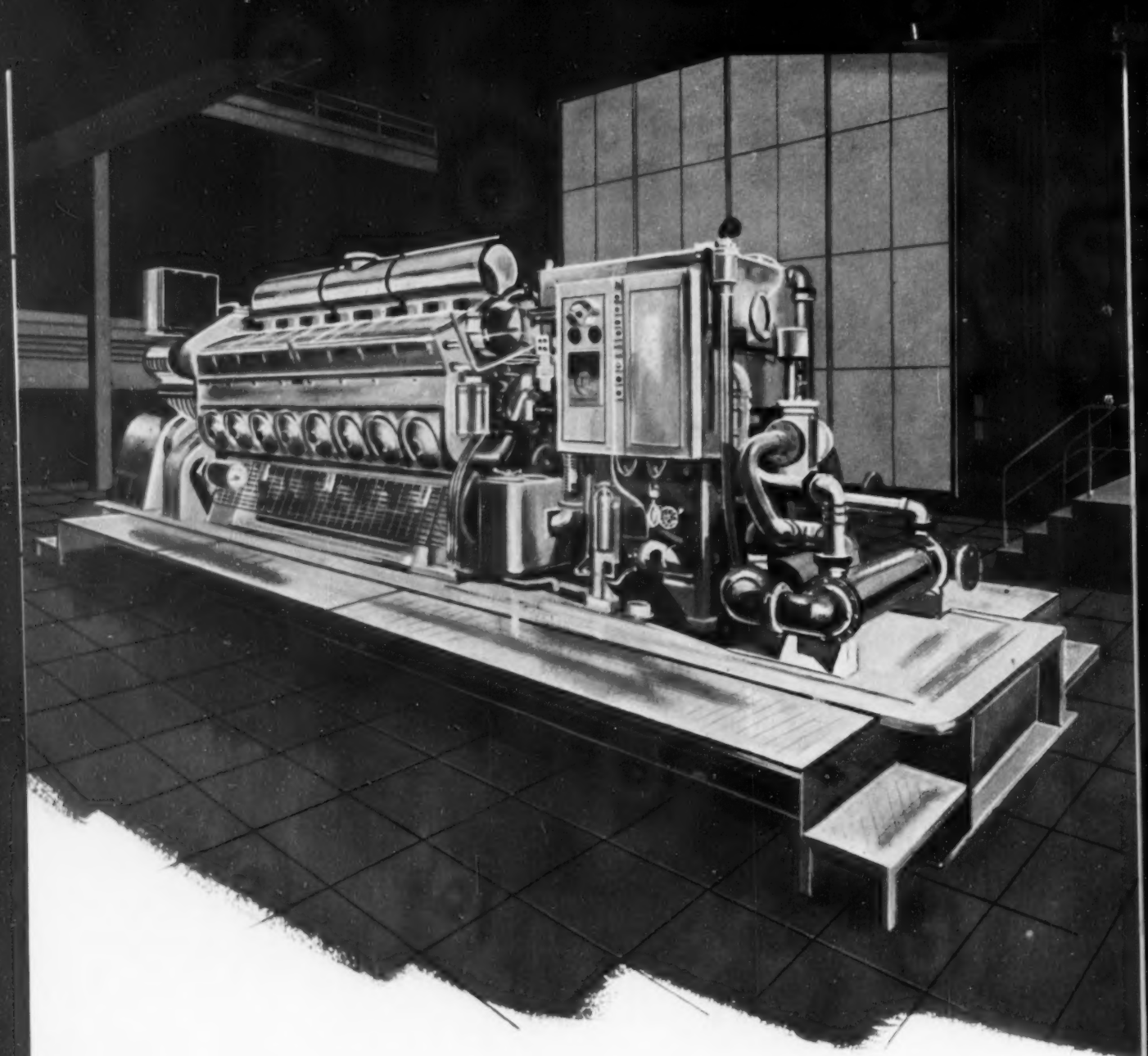




1. RAIL CAR

1,000, 750 and 500 kw. units for use on sidings, or placed on piers for semi-permanent use. Can be multiple for any capacity desired.





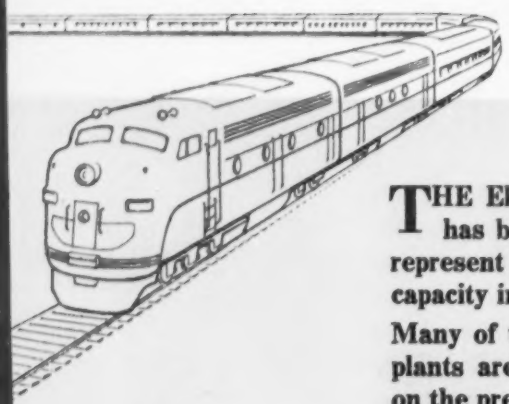
3. PORTABLE UNIT *1,000, 750, 500 and 350 kw. capacities for permanent or semi-permanent installations. Can be multipled for any capacity desired.*

Electro-Mobile Power

FEATURES INCLUDE:

- Remote control starting and stopping
- From starting to full load within 45 seconds
- Automatic synchronization with line in frequency, voltage and phase
- Inherent 25% overload capacity
- Full protective equipment, including 3-phase surge capacitors, lightning arresters, over-current relays, field failure relay
- Complete self-operation can be provided
- Ability to meet higher capacity needs by unit multiplication
- Complete national parts and service availability

May we present our credentials?



THE Electro-Motive Division of General Motors for twenty years has been building Diesel-Electric locomotives. These units today represent the equivalent of *one-sixth* of all the electrical generating capacity in the United States.

Many of the same well-tried components of these mobile generating plants are being used in the Electro-Mobile Power units presented on the preceding pages.

No radical new designs are involved. No "cobbled-up" assembly of miscellaneous or adapted parts is used. The complete units are built under a single roof—and under a single responsibility.

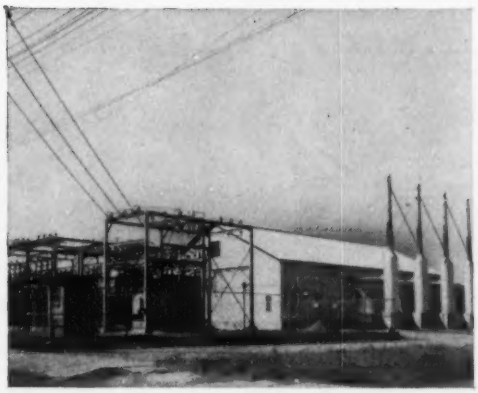
The controls that fit these units to electric utility applications are the most advanced devices, employing the most up-to-date materials, in this field. Their engineering has taken advantage of science's latest contributions.

And to this development, Electro-Motive Division is able to bring all the performance advantages and economies of mass production.

We believe we are presenting to the electric utility field a new and remarkably adaptable tool that will fit many problems in an unusually economical way. We'd like to discuss with you the potential benefits Electro-Mobile Power may hold for your specific needs.

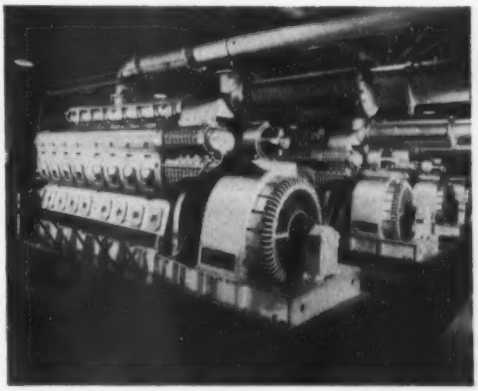
Electro-Motive Division
General Motors

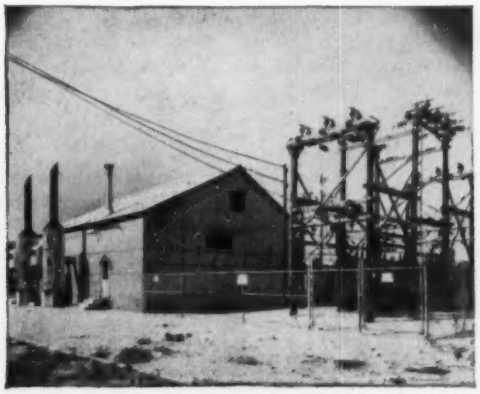
LA GRANGE • ILLINOIS



BE A SATISFIED CUSTOMER

For one customer alone, Pritchard has fulfilled contracts for 11 different diesel power installations. Such repeat contracts mean satisfied customers . . . are the best proof that Pritchard customers receive the design and construction skills, diesel know-how, and dependable services that are needed to produce modern, efficient installations.





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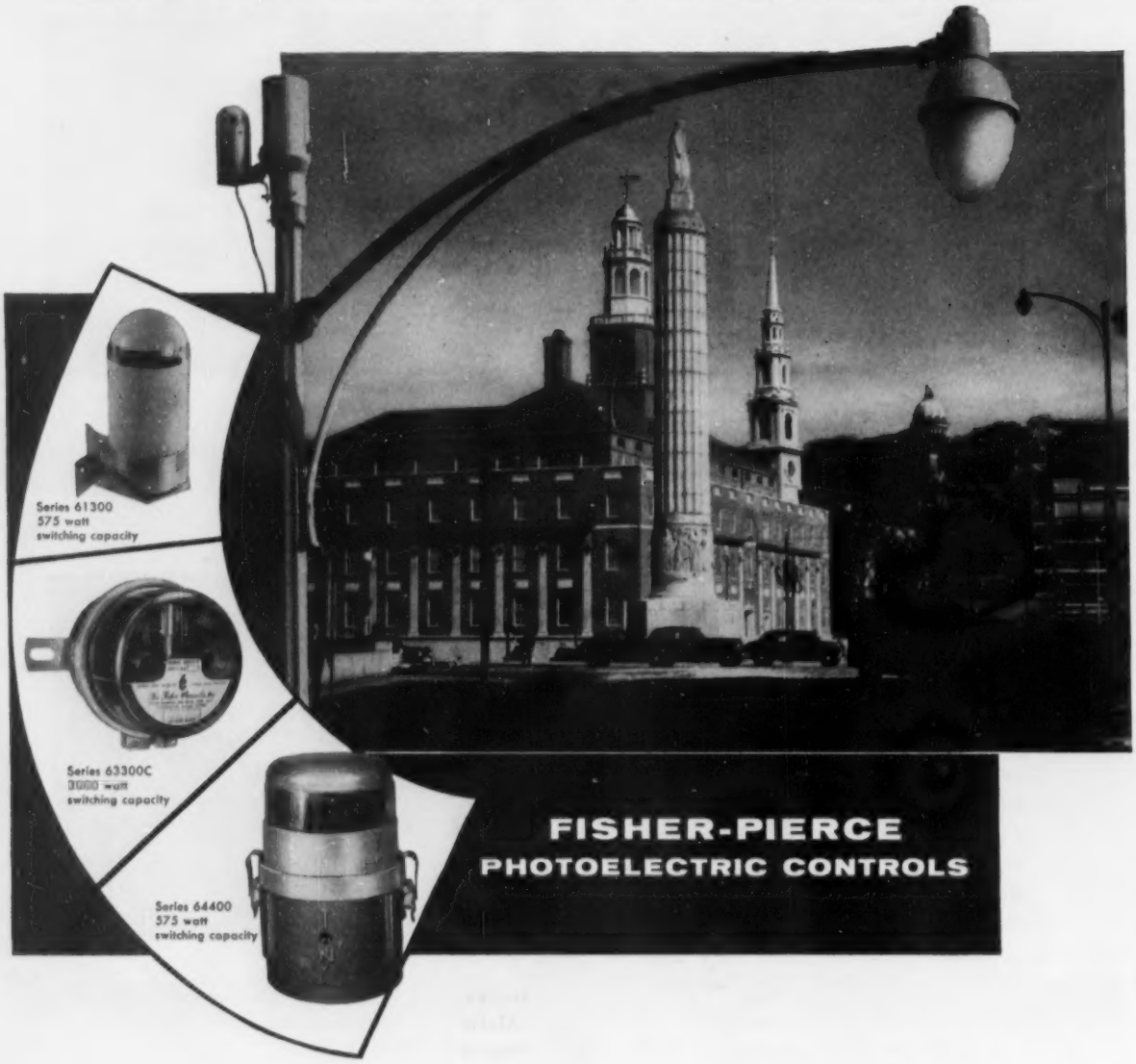
SERVING THE GAS, POWER, PETROLEUM AND CHEMICAL INDUSTRIES

CONTROLLING STREET LIGHTS IN PROVIDENCE, R. I.

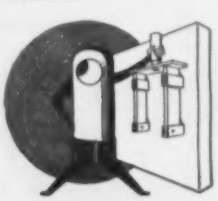


Motorists and pedestrians in Providence can thank their City Government for authorizing The Narragansett Electric Company to install dependable, automatically controlled street illumination.

The use of Fisher-Pierce street lighting controls assures dependable *automatic* illumination of streets the moment daylight drops below a safe value. Because F-P controls are photoelectric, they operate regardless of the hour, the season or the weather.

On the job in Providence since 1946, F-P controls now number about 3000. Narragansett engineers report favorable installation economics *and* an extremely low failure rate — only 2.29% of *all* units during a recent 12-month period.

Long, dependable service of F-P controls — in street lighting control systems in Providence and hundreds of *other* communities — is the basic reason Fisher-Pierce is recognized as a *leader* in its field.



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Every pound *helps haul itself* on these advanced FWD trucks. That's because it's "working weight." Improved Math-Matic Design—*exclusive* on FWD's—correctly proportions power to weight on front and rear axles. Each wheel's load makes it *grip harder*, using every ounce of power for greater controllable traction *on* or *off* the road.

From 30 to 37% longer tire life* . . . up to 82% more tractive ability* . . . safest by far to operate under *any* driving conditions* . . . all these extra values without extra fuel consumption—here are dollar and *sense* reasons why *you* should get full facts immediately on this greatly advanced line of heavy-duty trucks. Four-wheel-drive and six-wheel-drive models for any "truck-killing" job

- ★ **Greater power-weight ratio, higher RPM, thru new engine design!**
- ★ **Lower maintenance costs because of standardized parts!**
- ★ **Larger legal payload thru better weight distribution!**
- ★ **New comfort–convenience–safety in completely redesigned cab!**

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FWD MATH-MATIC DESIGN

BUILDERS OF AMERICA'S FOREMOST HEAVY-DUTY TRUCKS

THE FOUR WHEEL DRIVE AUTO COMPANY, CLINTONVILLE, WISCONSIN, *Canadian Factory,* KITCHENER, ONTARIO

KEEP YOUR POWER LOAD UP
...YOUR OUTAGES DOWN!

String Copperweld TRADE MARK

OVERHEAD GROUND WIRES

—and get PERMANENT PROTECTION for your Transmission Lines

Every year an average of 70,000 strokes of lightning hit power lines in this country, causing 10 times as many transmission outages as any other single factor. As a practical, economical solution to this serious problem, many power systems are using Copperweld* Overhead Ground Wires on their transmission lines to be sure of safe, low-cost and permanent protection against lightning damage.

Copperweld's thick copper covering, inseparably molten welded to the strong steel core of each wire, affords excellent electrical conductivity for relaying and for dissipating lightning discharges. And because this copper covering is rust resistant, the high strength of each wire remains permanent. Thus, with Copperweld Overhead Ground Wires, you can string with small sags to maintain ample mid-span clearances—even under the most severe weather conditions.

Plan now to shield your transmission lines with Copperweld Overhead Ground Wires. You'll find there's no better way to reduce lightning losses, keep upkeep down and be assured of constant uninterrupted service. Write today for your copy of the Copperweld Engineering Data Book—there's no obligation.

*Trade Mark

COPPERWELD STEEL COMPANY • Glassport, Pa.

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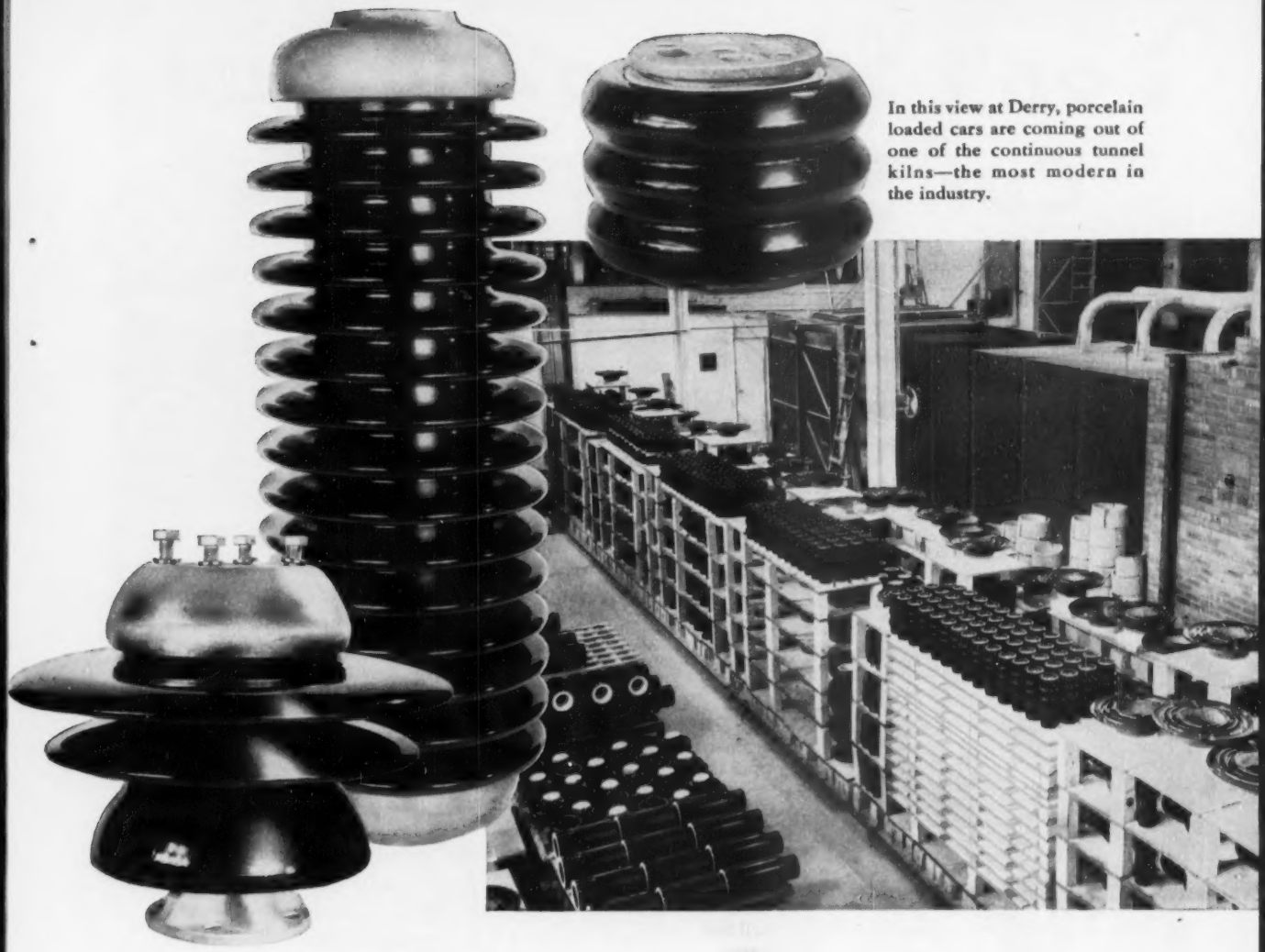
NON-RUSTING

OVERHEAD GROUND WIRES

Last The Life Of The Conductors They Protect!



In this view at Derry, porcelain loaded cars are coming out of one of the continuous tunnel kilns—the most modern in the industry.

Insulator quality vital to apparatus performance

It's easy to overlook the importance of the apparatus insulators in the performance of Westinghouse switchgear. Insulators are such "taken-for-granted" components that we may forget what it takes to make good ones.

The answer is quality—quality that stems from vigorous research and development, up-to-date production facilities, skilled craftsmen and priceless know-how. Apparatus insulators made at the Westinghouse Porcelain Department at Derry, Pa., reflect the experience gained in a plant that produces the country's greatest variety of electrical porcelain.

These facilities and craftsmen (average 20 years' service) have sparked such outstanding advances as larger, one-piece, pin cap insulators; casting process for outdoor station post insulators; high-strength glazes; Prestite®; solder-sealing; pressed steel hardware and the first line of indoor apparatus insulators meeting the industry's basic impulse insulation level standardized requirements.

Westinghouse apparatus insulators include a complete line of outdoor pin cap and new BIL indoor types in all strengths and voltage ratings, as well as outdoor station post insulators in all standard strengths through 69 kv.

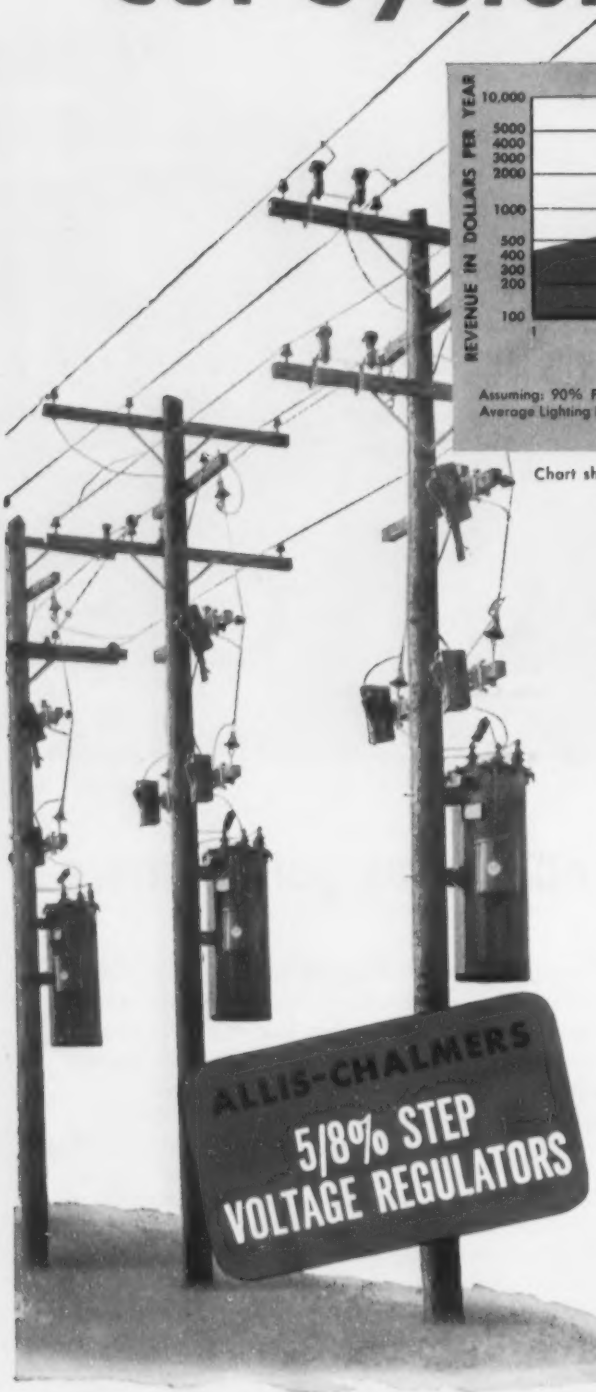
Proved insulator quality is one of many reasons why you can be sure of better performance—better value—with Westinghouse switchgear apparatus. Westinghouse Electric Corporation, 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pennsylvania.

J-60867

YOU CAN BE SURE...IF IT'S

Westinghouse

Don't Let Poor Voltage Cut System Profits!



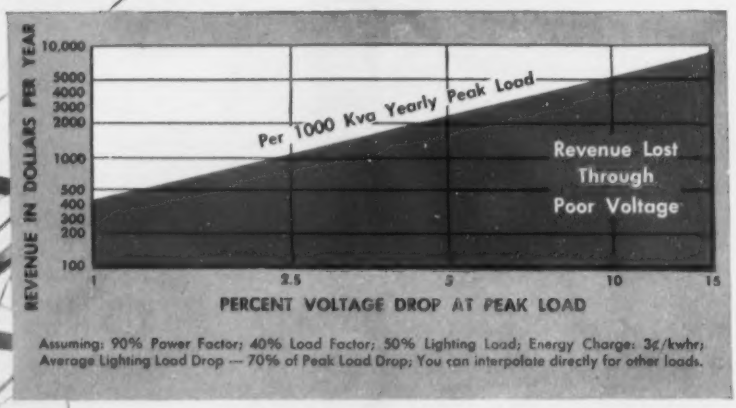


Chart shows revenue losses when voltage is poor on a typical distribution line.

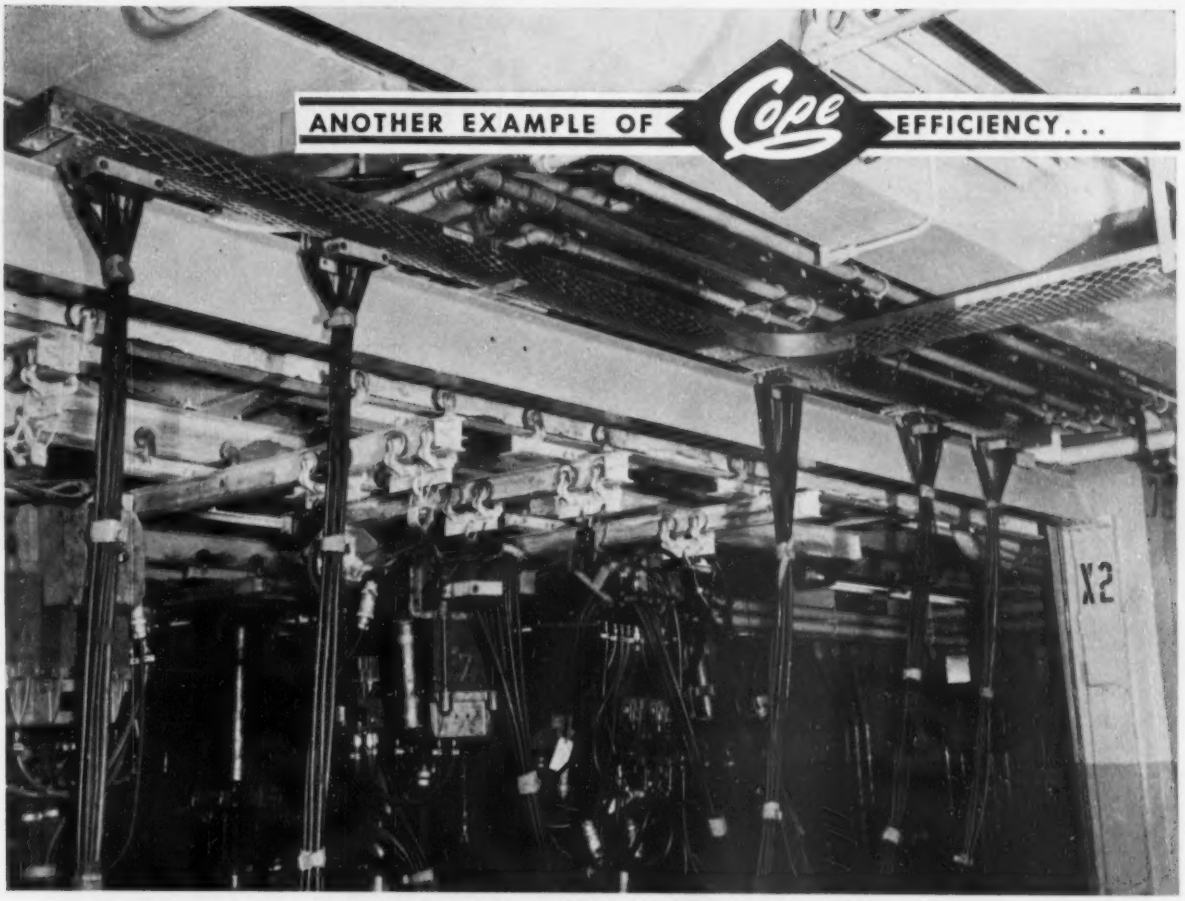
IF voltage is only 2.5% low on a 1000-kva yearly peak load, your system loses as much as $600 per year. Ten percent low voltage means loss of as much as $4500 in revenue. It's a direct loss in profits when your voltage isn't right.

There's an easy-to-install way to get this lost revenue back where it belongs—in the profit margin. An Allis-Chalmers distribution regulator not only will provide accurate voltage, it will pay for itself — in less than two years in many instances. After that, all revenue increases are pure profit.

It makes sense to choose Allis-Chalmers distribution regulators. Hundreds of distribution men will tell you about their accuracy and reliability — proved in twenty years of operation.

Field-proved design, rugged construction and simplified installation and maintenance add up to a regulator that can turn lost revenue into real profits for your system. Get more information from your nearby A-C office or write Allis-Chalmers, Milwaukee 1, Wisconsin. A-4416

ALLIS-CHALMERS



Cope Cable Trough installed at the Ford Motor Company, Dearborn, Mich.

COPE CABLE TROUGH—*VERSATILE, INDEED!*

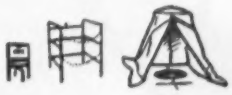
The photograph above shows a run of Cope Cable Trough carrying not only power cables for the overhead electric welders, but tubing for the cooling water as well! It is an excellent example of the versatility of this method of power distribution.

The low cost and the ease with which Cope Cable Trough may be installed are making it extremely popular these days as a standard system for the support of power and control cables.

And that's not all . . . the trough is available in a wide range of sizes and fittings which permit it to be quickly set up at the job site to conform to almost any plant layout.

Why not find out more about Cope Cable Trough? Write today for further information . . . Ask for Bulletin 10-W.

You know Cope by these products



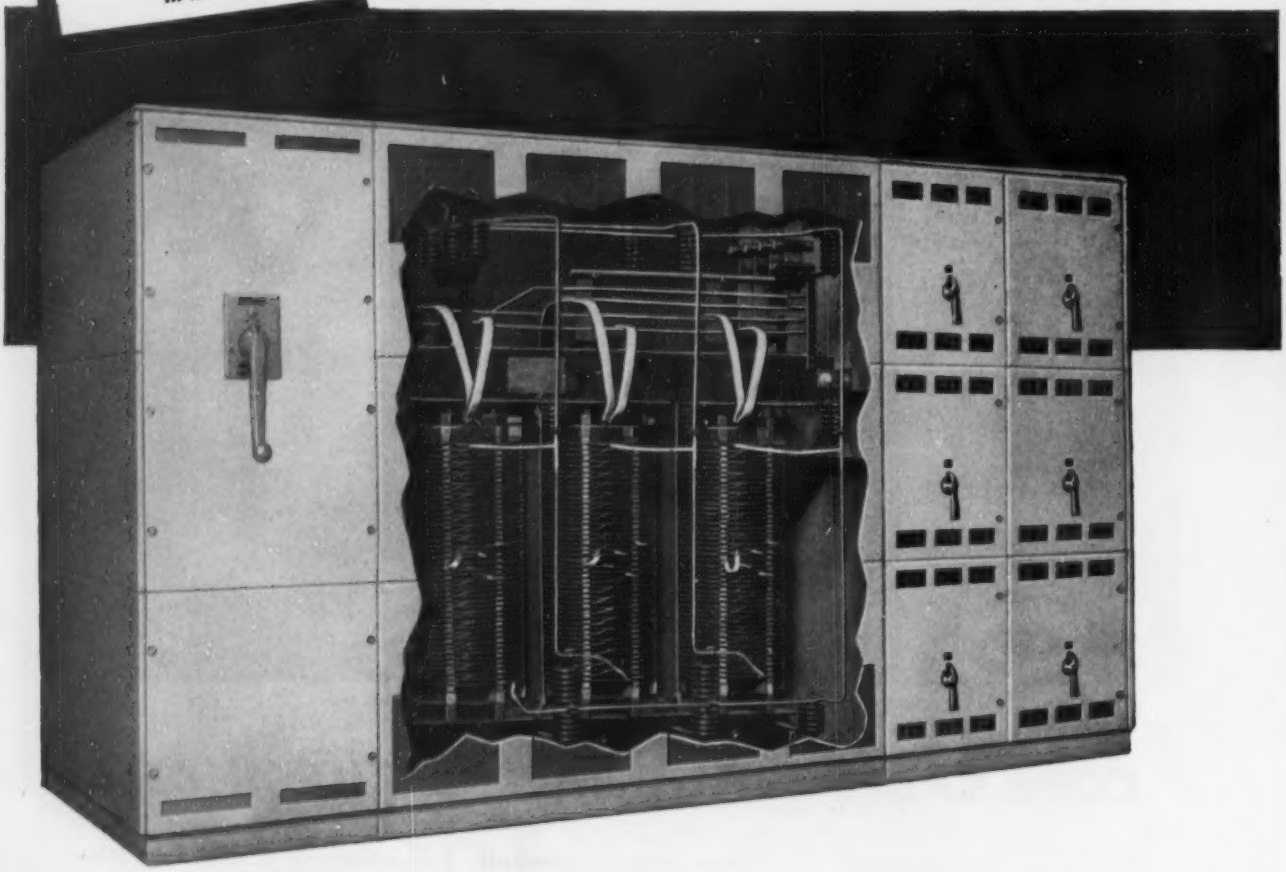
Cope

T. J. COPE, INC.

711 SOUTH 50th ST., PHILADELPHIA 43, PA.

Wagner®
TRANSFORMERS
...the choice of leaders in industry

for a reliable load-center



The importance of the transformers in your plant power distribution system cannot be overemphasized. If a switch or a circuit breaker fails, only a part of the system is usually affected—but if the *transformer* fails, the entire system is dead. When you specify Wagner, you can be sure of a dependable, continuous flow of power.

Wagner manufactures both dry type and liquid-filled Unit Substation Transformers, in ratings through 2000 kva, 15 kv and below—you can choose a type and rating exactly *right* for your requirements.

Bulletins TU-56 and TU-13 give full information. Write for your copies today.

Wagner Electric Corporation
EST. 1891

WAGNER ELECTRIC CORPORATION
6456 Plymouth Ave. • St. Louis 14, Mo., U. S. A.

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS — AIR AND HYDRAULIC

BRANCHES IN 32 PRINCIPAL CITIES

T54-9

power supply---*always specify...*

Wagner

PREDESIGNED Dry Type Transformers

you gain because:

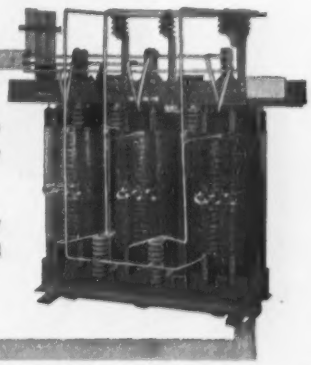
- **you save shipment time**
- **you save job engineering costs**
- **you get full Wagner Quality with switchgear of your choice**

Wagner "Predesigned" Dry Type Substation Transformers are carefully engineered to meet heavy industrial demands. Predesigning completely eliminates individual job engineering . . . reduces your costs . . . and saves shipment time.

Wagner "Predesigned" Dry Type Transformers consist of standardized core and coils rated from 112.5 to 2000 kva. All Unit Substation builders have the information and coordination necessary to use these transformers with switchgear of your choice.

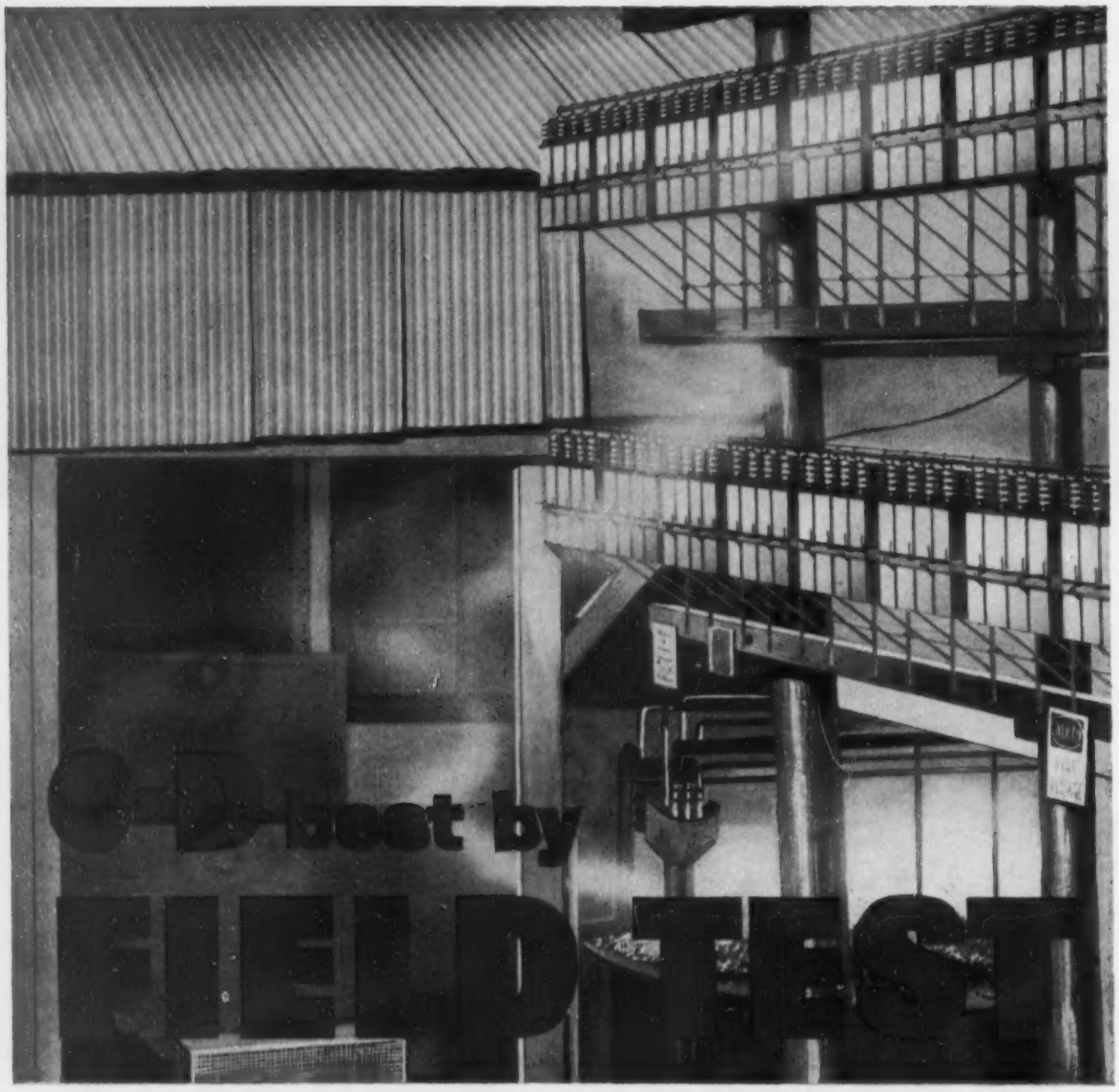
You can specify the Wagner Transformer that exactly meets your load-center distribution requirements—be assured of full Wagner Transformer Quality—and gain a substantial advantage in delivery time and in cost.

Investigate the many advantages of specifying Wagner "Predesigned" Dry Type Unit Substation Transformers for your next load-center installation. Consult the nearest of our 32 branch offices, or write direct to us.



Wagner "Predesigned" Dry Type Unit Substation Transformers are for indoor installation. Because of their relatively light weight, they can be used in multi-story buildings.

These transformers are not designed for minimum duty only—they have all the Wagner quality necessary to meet heavy industrial demands. You can depend on Wagner for quality.



This southeastern C-D capacitor installation is situated at the entrance to a large metallurgical smelter. Furnace temperatures run well over 3,000°F and the fumes are acidic. As a result these C-D capacitors are exposed to excessive temperatures and acid fumes that create a conducting electrolytic path leading to leakage and lower arc resistance of major bushing insulation. Yet, these C-D capacitors have given trouble-free service year after year, with little or no maintenance! It's another example of how C-D's superior engineering design that builds an extra margin of safety into each and every capacitor, pays off in the field year after year.

A C-D engineer can save you important maintenance dollars on your next power-factor installation. It will pay you to talk over your power-factor problems with him. No obligation, of course.

Cornell-Dubilier Electric Corporation, Dept. D-104, South Plainfield, N. J.

There are more C-D capacitors in use today than any other make

CONSISTENTLY DEPENDABLE

CORNELL-DUBILIER CAPACITORS

FOR POWER-FACTOR IMPROVEMENT

PLANTS IN SOUTH PLAINFIELD, N. J.; NEW BEDFORD, WORCESTER AND CAMBRIDGE, MASS.; PROVIDENCE AND HOPE VALLEY, R. I.; INDIANAPOLIS, IND.; SANFORD AND FUQUAY SPRINGS, N. C.; SUBSIDIARY: THE RADIART CORPORATION, CLEVELAND, O.

Hotpoint

has PROVED that water heating is done best by ELECTRICITY

Hotpoint Electric Water Heaters have proved by their efficiency that heating water by electricity is not only practical . . . it's the *best* way to do it. The American public has purchased 6,000,000 electric water heaters. This means that there are 6,000,000 more electric power buyers developing utility revenue. And further—these are steady, round-the-clock customers who help balance your load during off-peak hours.

Hotpoint offers a complete line of water heaters to meet every need. There's a full range of sizes in both round and table-top models. Every unit features the famous MAGIC CIRCLE® heat with Calrod® heating units. Water is heated by conduction, the most direct and simple way.

Because Hotpoint pioneered this business, and, because Hotpoint Water Heaters are the recognized leaders, nearly 2,000,000 of the water heaters in use today were made by Hotpoint. Learn all the facts about Hotpoint Automatic Electric Water Heaters from your local Hotpoint distributor. Keep building acceptance for electric water heaters, and build assured revenue for the future with Hotpoint . . . the world's finest.

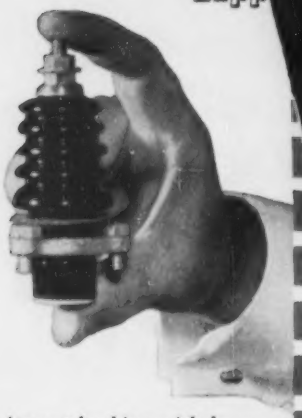
Again Hotpoint looks at Tomorrow, Today

HOTPOINT Co. (A Division of General Electric Company) 5600 West Taylor Street, Chicago 44, Illinois

bushings by Lapp

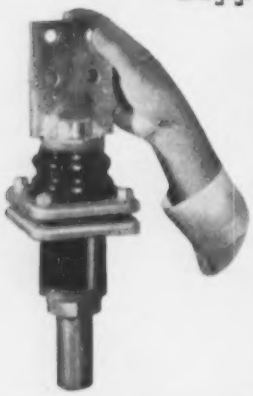
LAPP INSULATOR CO., INC., LE ROY, N.Y.

Lapp



Small equipment bushing with draw-lead terminal. Flashover: 30 kv dry, 20 kv wet. Similar design available in lower and higher voltage ratings.

Lapp

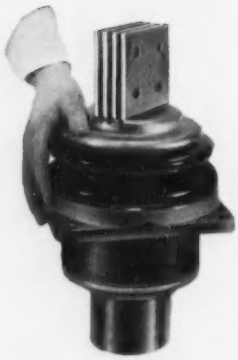


High-current secondary bushing with non-magnetic mounting adapter for welding to transformer tank. Units available 400 to 2500 ampere ratings.

Lapp

Network transformer bushing, 1400 ampere, with flexible terminal assembly, which provides for outside alignment with network protectors.

Lapp



High-current secondary bushing, 2.5 kv, 3200 amp rating, with integral NEMA spade terminal. Gasketed for pressure sealing.

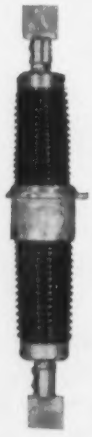
Lapp

Precipitator bushing, liquid-filled, with spring-loaded sealing. Operates at 70 kv under 50,000 lb. load. Excellent service record for 22 years.

pp

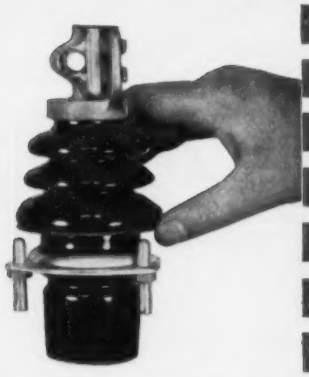
Radio-interference-free special oil-filled bushing for testing equipment. Corona-free, for operating voltages at 25, 50, 100 and 150 kv.

Lapp



Oil-filled bushing, 37 kv, 2000 amp. Spring-loaded sealing; special design for horizontal mounting. In continuous trouble-free service since 1939.

Lapp

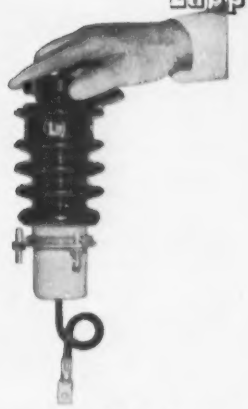


Draw-lead cover-type distribution transformer bushing (NEMA specification). 5 kv to 23 kv ratings. Available with external clamping.

Lapp

Low-voltage secondary transformer bushing—450, 600, 800 amp ratings. External clamping type also available. Gaskets suitable for askarels.

Lapp



Protective-cap sidewall transformer bushing, 8.7 kv. Bakelite knob operates spring-loaded universal (⅛ to 7/16") clamp. Confined gaskets.

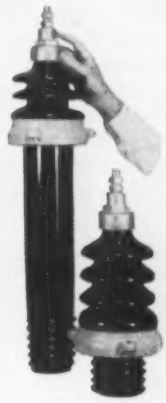
Lapp

Weather-tight entrance bushing of series rated 7.5 to 34.5 kv, 300 to 2000 amps. Terminals available for use with tube, cable, bar.

Lapp

Standard dry-type high-current apparatus bushing, with terminals. Available voltage ratings 5 to 23 kv, current ratings 400-3000 amps.

Lapp

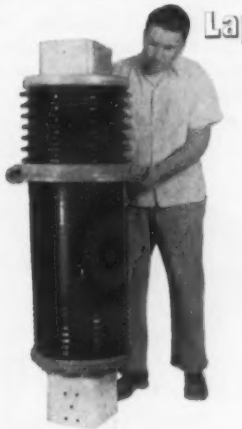


Dry-type apparatus bushings with special modifications—short shank for throat mounting, long shank for lower-than-usual oil levels.

Lapp

Indoor-outdoor bushing, 5000 amp, 23 kv rating. 6" square conductor. Double flange mounting—weatherproof. Other ratings also available.

Lapp



Unusually large (weight 646 lbs.) indoor-outdoor generator lead bushing. High current (7000 amp) 23 kv duty. 9" square conductor.

Lapp

Special 3000-amp entrance bushing, designed for minimum outside diameter; conductive-coated for corona freedom. Silver-plated conductor.

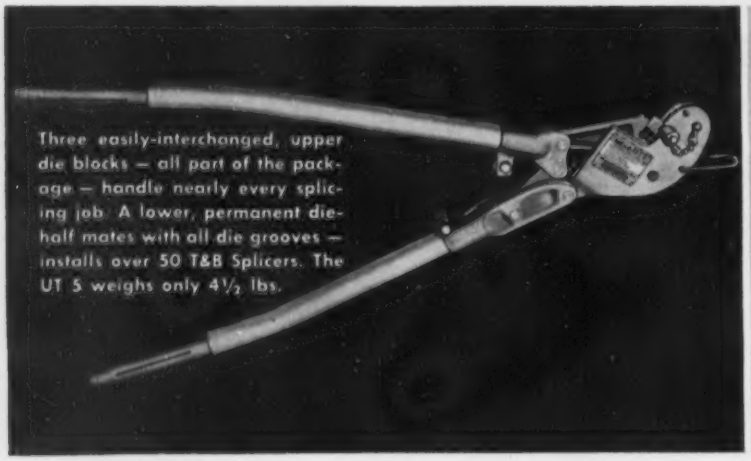
T&B's COMPLETE SPLICING PACKAGE *for*

COPPER
Solid and Stranded
#8 stranded to #2 stranded

ALUMINUM
Solid and Stranded
#6 solid to 2/0 stranded

A.C.S.R.
#6 (6x1) to 1/0 (6x1)

THE UT 5 INSTALLING TOOL...AND THE SPLICERS



Three easily-interchanged, upper die blocks — all part of the package — handle nearly every splicing job. A lower, permanent die-half mates with all die grooves — installs over 50 T&B Splicers. The UT 5 weighs only 4½ lbs.

One UT 5 Installing Tool is all that's needed to splice a wide range of service and distribution conductors. Switch to T&B and use *one* tool instead of many; slash tool costs and inventories to a minimum.

High mechanical advantage of the UT 5 tool minimizes manual effort required to make strong, electrically efficient splices. Hardened steel dies force splicer and conductor into a *square*-sectioned, homogeneous mass. Compound lower die design provides a high-unit-pressure area for installing the steel core of A.C.S.R. Dies are easily changed by loosening a single thumb screw. No tools required. Die grooves and connectors are conveniently letter-coded to assure proper die selection.

Let your T&B Distributor demonstrate the UT 5 and its many advantages . . . see how one UT 5 does the work of a dozen or more tools.

T&B Bulletin 71 gives the full story on the UT 5 Installing Tool and the wide range of T&B Splicers that it will install. Send for your *free* copy today.

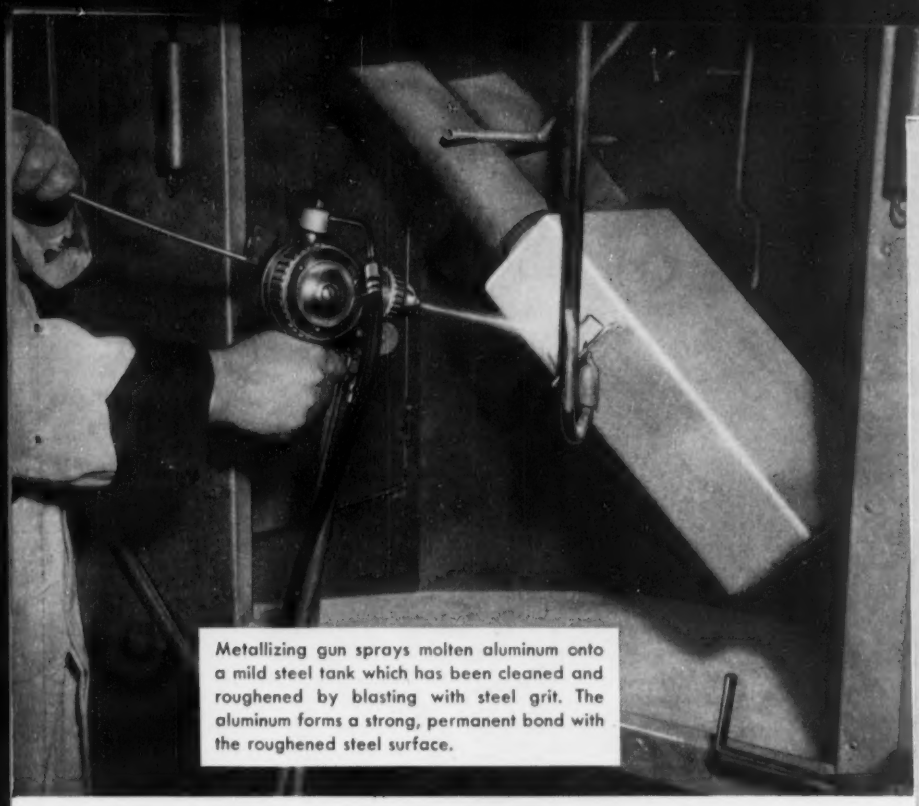
LOOK FOR THIS SIGN —

AUTHORIZED DISTRIBUTOR T&B ENGINEERED

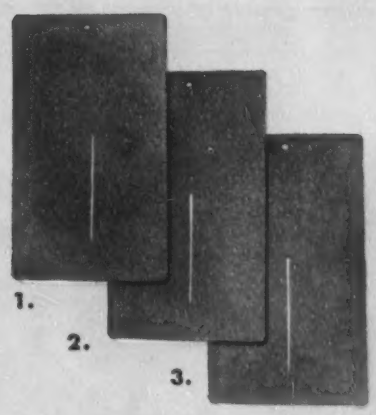
IT'S THE MARK OF AN AUTHORIZED T & B DISTRIBUTOR

The complete line of T & B fittings for conductors and raceways is sold only by recognized electrical wholesalers. It's our way of assuring you the service and savings of a friendly local source. Call him for all your electrical needs. T-425

THE THOMAS & BETTS CO.
INCORPORATED
14 Butler Street • Elizabeth 1, New Jersey
Thomas & Betts Ltd., Montreal, P.Q., Canada
MANUFACTURERS OF QUALITY ELECTRICAL FITTINGS SINCE 1898



Metallizing gun sprays molten aluminum onto a mild steel tank which has been cleaned and roughened by blasting with steel grit. The aluminum forms a strong, permanent bond with the roughened steel surface.



1. Steel panel which has been aluminum-metallized, primed, and finish-coated. A deep gouge has been made down to the bare steel.

2. Identical panel, after 160 hours' exposure to standard ASTM salt spray test. Note there is no corrosion in the scratch.

3. A similar panel, after 1034 hours in the salt spray. No corrosion has occurred where the bare steel has been exposed, demonstrating aluminum's protective quality.

L-M Aluminum Metallizing Increases ELEMEX® Capacitor Tank Life

Capacitor tank corrosion now postponed indefinitely with aluminum metallic coating under the paint.

By **BLAINE SCHULTZ**
Section Engineer
Line Material Company

The tanks of Elemex capacitors have had excellent protection with the alkyd resin paints we have used. These paints have shown remarkable life under both laboratory tests and severe service conditions.

On a few occasions some corrosion has occurred, caused either by rough handling that damaged the paint finish, or by exceptionally corrosive atmospheres. Rather than provide special treatment for such situations, we are now applying a coating that will meet almost any demand that can be placed upon it.

This process consists of aluminum metallizing, followed by a chromate primer coat and a finish coat of alkyd resin paint. The finish coat is dark in color to expedite heat radiation and keep the capacitor packs at low operating temperatures.

Why Aluminum Is Preferred

A number of possible metal coatings were tested. Aluminum was selected because of a number of important advantages. One is that aluminum is a "sacrificial" metal. If, during handling, a capacitor tank should be scratched through the paint and the aluminum coating, down to the steel, the aluminum will prevent oxidation of the steel by "sacrificing" itself. This can be demonstrated on a scratched panel with the bare steel exposed. Even after lengthy exposure in a salt spray test, the steel stays clean and free from oxidation.

Aluminum is also harder than other non-ferrous metals and resists cuts and abrasions better. It is also compatible with prime and finish coats of paint which are applied over it. It will not form corrosion products which leach through or cause blistering of paint film.

For these reasons aluminum is greatly preferred over other non-ferrous metals and was selected for the protection of Elemex capacitor tanks. This process is now being applied to the mild steel tank of all outdoor Elemex capacitors.

Other Features of L-M's Elemex® Capacitors

Packs are assembled in air-conditioned rooms to assure uniformity.

Every pack is individually tested with over-voltage to detect any actual or potential defects.

Elemex capacitors are individually dried and completely impregnated under vacuum.

Exclusive "Paragroove" clamp-type terminal has low resistance, less heating; no parts to remove when connecting; rugged construction; simplifies wiring.

Strong solder-sealed bushings are one-piece wet-process porcelain, with two metallized bands over the glaze. It takes more than 3000 pounds to push an L-M bushing out of the cover.

Uniform terminal height above mounting flanges in any voltage class for convenient interchanging of capacitors.

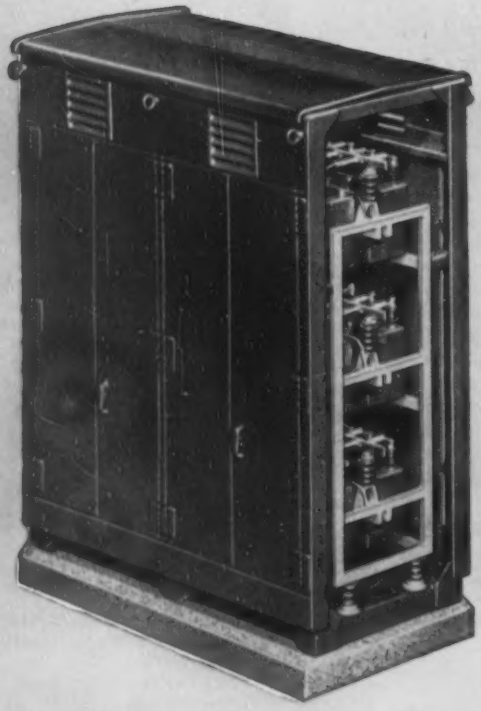
Choice of standard or low temperature Elemex liquid dielectric.

Get Complete Information on Elemex Capacitors

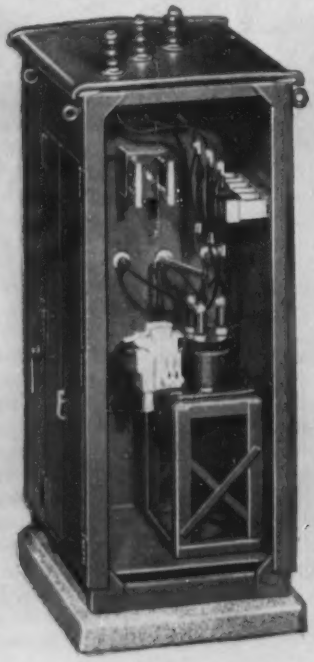
Elemex capacitors offer many desirable features. They are available in 15 and 25 kvar sizes, in ratings from 2400 to 13,800 volts. Ask the L-M Field Engineer for a copy of Bulletin PC1, or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

LINE MATERIAL *Elemex® Capacitors*

Scale models of L-M Metal-Enclosed Capacitor Equipments. At extreme right is control compartment; next, the oil circuit breaker compartment; center, an 1800 kvar compartment with doors opened to show Elemex individually fused capacitors in racks.

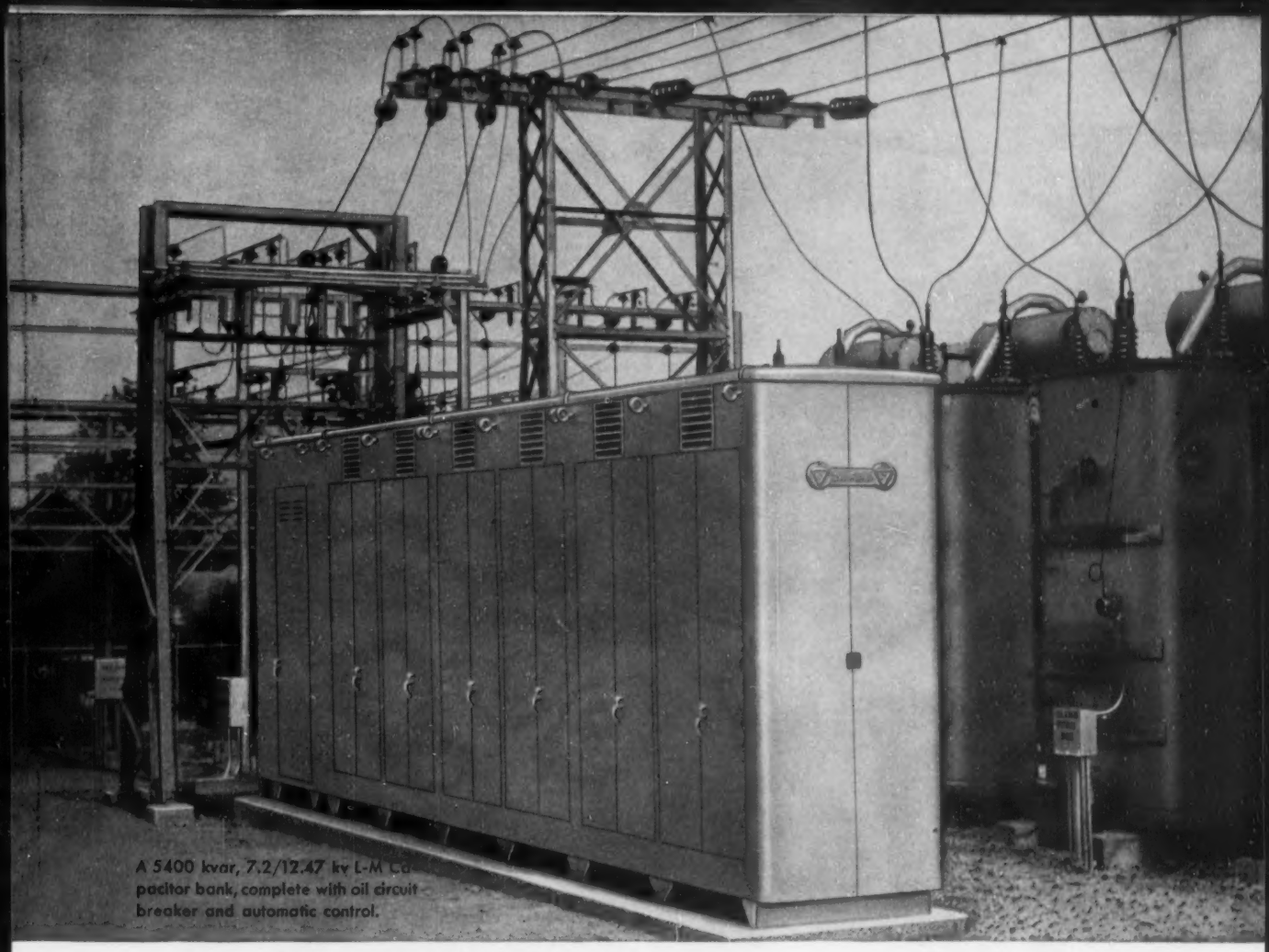


Scale model of an 1800 kvar capacitor compartment, showing how capacitor units and fuses are mounted on insulated inner rack behind interlocked doors.



Typical oil circuit breaker compartment includes breaker, current and potential transformers, and accessories.

Typical control panel with overcurrent relays, ammeters, recording voltmeter, voltage control, and other necessary relays and control switches.



A 5400 kvar, 7.2/12.47 kv L-M Capacitor bank, complete with oil circuit breaker and automatic control.

L-M's Metal-Enclosed Capacitor Equipments Provide Wide Choice of Sizes and Arrangements

by **N. K. DELANEY**
Manager of Capacitor Sales
Line Material Company

L-M's Metal-Enclosed Capacitor Equipments provide a self-contained three-phase bank with or without switching equipment and complete controls. The assembly makes a neat-appearing installation; is extremely compact; and provides a high degree of safety, because no live parts are accessible except through doors which are interlocked with the short-circuiting and grounding switch.

L-M's Metal-Enclosed Capacitor Equipments provide wide flexibility. All control equipment is in one compartment. A second compartment contains the circuit breaker, current and potential transformers, and short-circuiting and grounding switch.

Capacitor compartments contain racks of Elemex capacitors. Sizes range from 600 to 1800 kvar, and voltages from 2400 to 13,800. These compartments are provided with thermostatically controlled cooling fans, and doors interlocked with the grounding switch. Equipments are exceptionally rigid, heavy steel, completely finished for long protection against weather. All capacitors have individual bus-mounted flameless fuses with indicating feature. A variety of convenient accessories is available. Connections may be underground through potheads, or to bushings at top of breaker or power entrance compartment.

Get The Details

Ask the L-M Field Engineer for complete information about L-M Metal-Enclosed Capacitor Equipments and about L-M's Complete Capacitor Application Engineering Service. Or write Line Material Co., Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

Sizes and Ratings Available

L-M Metal-Enclosed Capacitor Equipments are available in the following NEMA-standard ratings:

2400/4160 volts: 600, 900, 1200, 1800, 2700, and 3600 kvar.

4800, 7200, 12,470, and 13,800 volts: 900, 1800, 2700, 3600, 4500, and 5400 kvar.

In 5 kv class equipments the capacitor compartments are in 600, 900, 1200, and 1800 kvar sizes.

In 8.7 and 15 kv class equipments standard compartment sizes are 900 and 1800 kvar.

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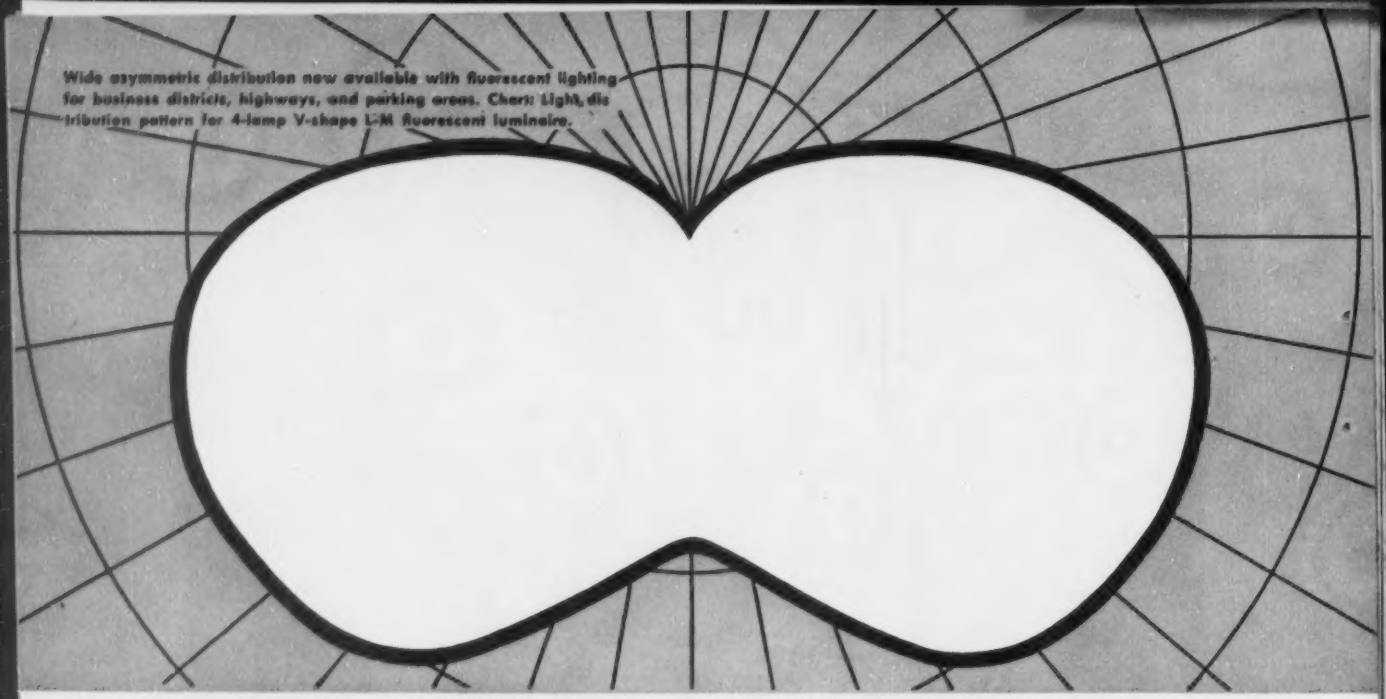
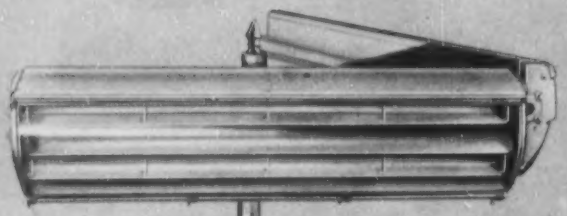
LINE MATERIAL *Elemex®* **Capacitors**



Wide asymmetric distribution now available with fluorescent lighting for business districts, highways, and parking areas. Chart: Light distribution pattern for 4-lamp V-shape L-M fluorescent luminaire.

L-M Fluorescent Luminaire Installation Data

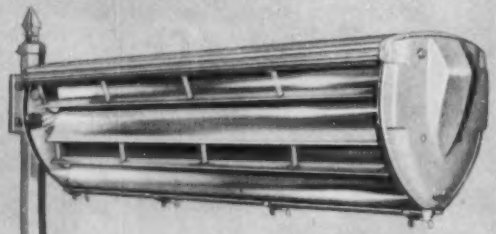
Average foot candles at 50° F. temp. in still air—25′ mounting height. Illustrations below show L-M's various types of units and mountings, together with the average foot candles on the street with various spacings.



4-lamp V-shape fluorescent luminaire provides more even light distribution for wide streets.

4-Lamp V-shape Fluorescent Luminaire*

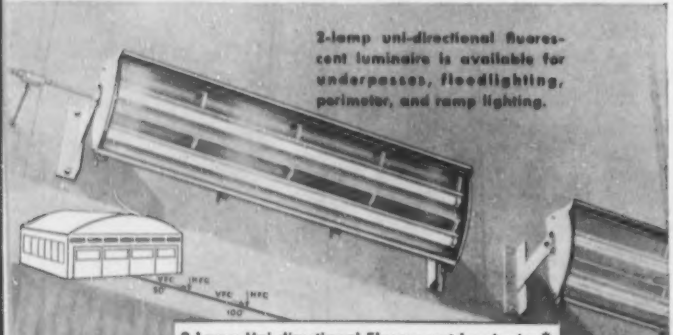
Spacing	Staggered 50′ Street Width	Opposite 70′ Street Width
75 ft.	1.75 A.F.C.	—
100	1.30	2.15 A.F.C.
125	1.05	1.90
150	0.85	1.45
175	—	1.25



4-lamp bi-directional fluorescent luminaire provides a broader light pattern for center parkway and area lighting.

4-Lamp Horizontal-mounted Fluorescent Luminaire*

Spacing	Center-Mounted Twin Arm 40′ Road Twin Roadways	Staggered 50′ Street Width	Opposite 70′ Street Width
75 ft.	2.85 A.F.C.	1.35 A.F.C.	—
100	2.15	1.00	1.55 A.F.C.
125	1.70	0.80	1.26
150	1.40	0.65	1.05
175	1.20	—	0.90

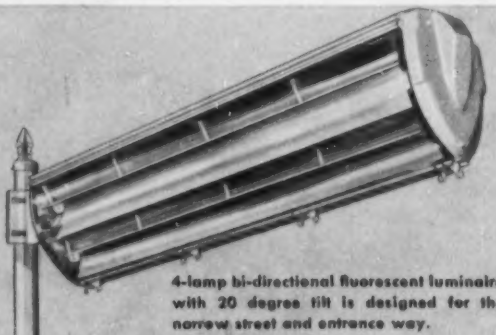


2-lamp uni-directional fluorescent luminaire is available for underpasses, floodlighting, perimeter, and ramp lighting.

2-Lamp Uni-directional Fluorescent Luminaire*

Readings were made of ramp installation consisting of ten 2-lamp uni-directional fluorescent luminaires. 22′ mounting height—spaced 8′ on center.

Dist. From Source	Vertical F.C.	Horizontal F.C.
50 ft.	9.70	6.50
100	2.40	1.20
150	1.10	0.35
200	0.65	0.05
250	0.40	—
300	0.25	—
350	0.20	—



4-lamp bi-directional fluorescent luminaire with 20 degree tilt is designed for the narrow street and entrance way.

4-Lamp Tilted Fluorescent Luminaire (20° Tilt)*

Spacing	Staggered 40′ Street Width	Staggered 50′ Street Width	Opposite 70′ Street Width
75 ft.	1.50 A.F.C.	1.35 A.F.C.	—
100	1.15	1.05	1.60 A.F.C.
125	0.90	0.80	1.30
150	0.75	0.65	1.10
175	—	—	0.90

*From test reports E353-83, E353-817, E353-810, E353-88.

A Fluorescent Community is a Progressive Community. L-M fluorescent lighting means fewer accidents, less crime, more business.

L-M's New Fluorescent Street Lighting Luminaire
Large Light Source, Minimum Glare

By **STACY STANDLEY**
Manager
Lighting Sales
Line Material Company

L-M's New Fluorescent Luminaire is a revolutionary improvement in street lighting. With its large light source the fluorescent luminaire produces an even, cool white color over a large area. Because of its large light source, it provides virtually glareless illumination.

Fluorescent luminaires provide a light that is particularly advantageous in business and shopping sections. The surrounding sidewalk area adjacent to the curb is illuminated and gradually fades out to make the background contrast as gradual as possible. This provides a wider scope of vision for both the motorist and the pedestrian, in addition to creating a cheerful and active atmosphere in the shopping area.

L-M's New Fluorescent Luminaires are available in these styles:

1 4-lamp V-shape for use on wide streets

2 4-lamp bi-directional tilted 20° toward the street for narrower streets and entrance ways

3 4-lamp bi-directional with level horizontal mounting for center parkway and area lighting

4 2-lamp uni-directional for underpass, flood lighting, perimeter and ramp lighting

The fluorescent lamp used in these luminaires has a rated lamp life of 7500 hours. This longer lamp life reduces the cost of relamping luminaires below any other type now used for street lighting.

Features of L-M's New Fluorescent Luminaires

Large light source • Even, cool white color • Minimum glare • Low power consumption • Longer lamp life

Separate efficient reflecting system for each lamp • Good vertical component across the whole surface of the street • Good balance between building and road surface

Two lamp ballasts • Easy accessibility for relamping • Wiring terminal block easily accessible • Ballast can be removed very simply • Bracket adjustable ±5° for leveling.

L-M's fluorescent luminaires are easily accessible for cleaning, relamping, wiring terminal block and ballast removal. Four-lamp unit has two ballasts with one tube on either side of the luminaire paired to each ballast. Thus, if one tube burns out, the light output of the luminaire is reduced only 50% in each direction. Also, if desired, two lamps could be switched off for part night circuits.

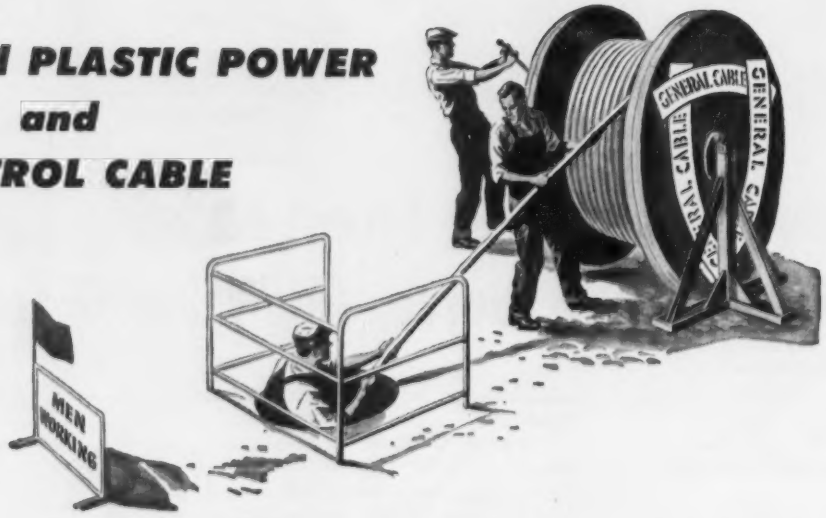
Get Complete Information

Details of the new L-M fluorescent luminaires are available. Ask the L-M Field Engineer for information, or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

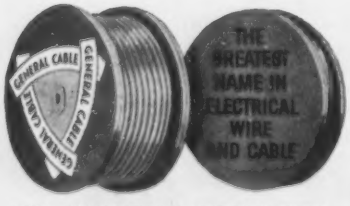
LINE MATERIAL
Street Lighting

THE GREATEST NAME IN ELECTRICAL WIRE AND CABLE

RUBBER and PLASTIC POWER and CONTROL CABLE



Every type for every use!



BARE, WEATHERPROOF, INSULATED WIRES and CABLES FOR EVERY ELECTRICAL PURPOSE

Besides offering the most complete line, General Cable makes top notch engineering service and useful product information easily available.

Rubber and Plastic Power and Control Cables are designed for power transmission, distribution and control...for duct and conduit installation...for direct earth burial...for submarine and aerial use (self supporting types are available).

Rubber or GENCORONE (corona resistant) oil base compound or plastic insulated...with braided, leaded, interlocked or submarine armored finish.

These popular and versatile lines of products are made to meet practically every operating condition. Get the full facts before you buy. Let our engineers help solve your wire and cable problems.

GENERAL CABLE CORPORATION

420 Lexington Avenue, New York 17, New York • Sales Offices: Atlanta • Boston • Buffalo Chicago • Cincinnati • Cleveland • Dallas • Detroit • Greensboro (N. C.) • Houston • Indianapolis • Kansas City • Los Angeles • Memphis • Milwaukee • Minneapolis • New York • Newark (N. J.) • Philadelphia • Pittsburgh • Portland (Ore.) • Richmond (Va.) • Rochester (N. Y.) Rome (N. Y.) • St. Louis • San Francisco • Seattle • Syracuse • Tulsa • Washington, D. C.

GP-42A

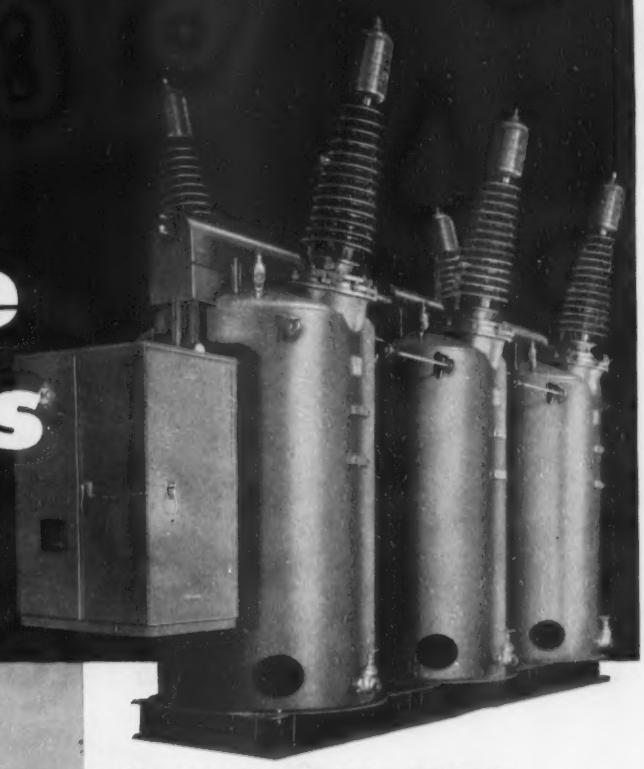
ALLIS-CHALMERS

PROGRESS IN

Switchgear

compare breakers

get the breaker with ALL the important features



HERE'S A COMPARISON OF HIGH VOLTAGE BREAKERS

FEATURES	Allis-Chalmers Breaker	Breaker X	Breaker Y	Breaker Z
Pneumatic Operator	Yes	Yes	Yes	No
Mechanically trip-free	Yes	No	Under certain conditions	*
Electrically trip-free	Yes	Yes	Yes	*
Hydraulic Operator	Yes	No	No	Yes
Mechanically trip-free	Yes	*	*	No
Electrically trip-free	Yes	*	*	Yes
Electrically Tested —				
Laboratory	Yes	Yes	Yes	No
Field	Yes	Yes	Yes	Yes

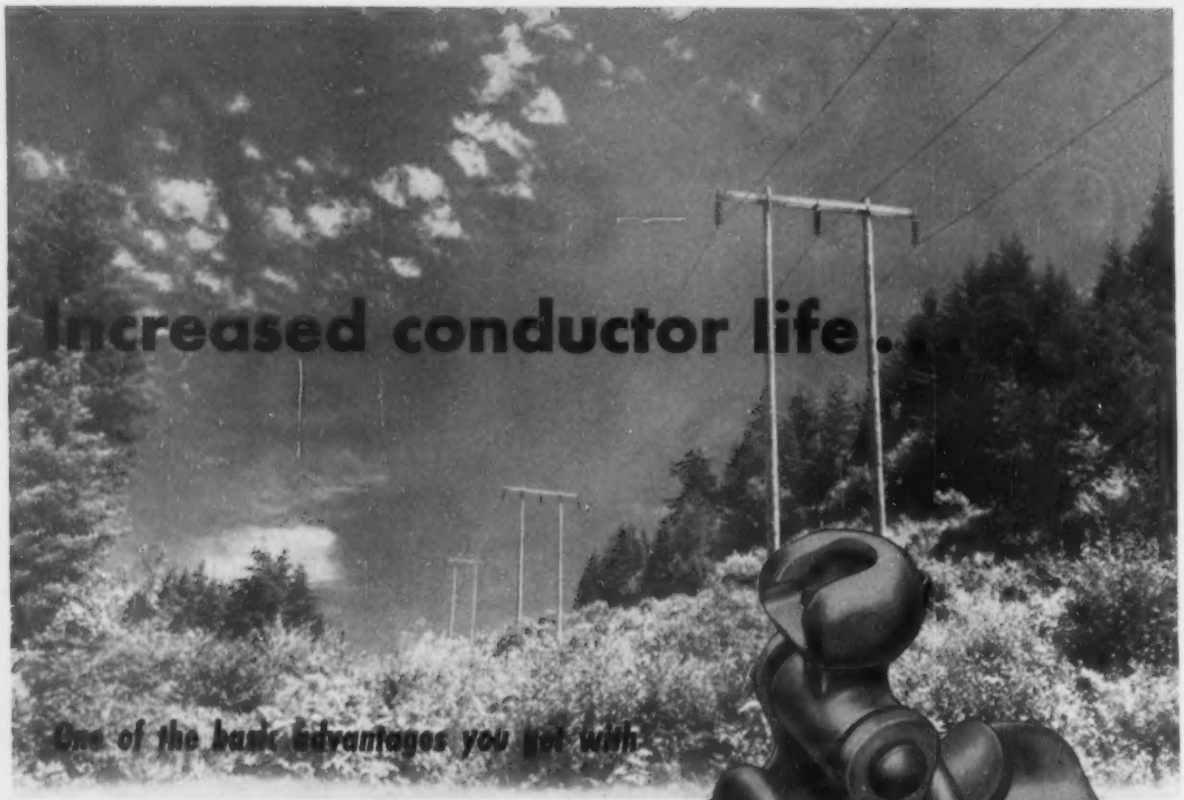
*Not Applicable

Allis-Chalmers reliable breaker performance is based on more than 50 years of circuit breaker design, manufacturing and field experience.

Get complete engineering information! Call your nearby Allis-Chalmers district office, or write Allis-Chalmers, Milwaukee 1, Wisconsin. A-4290

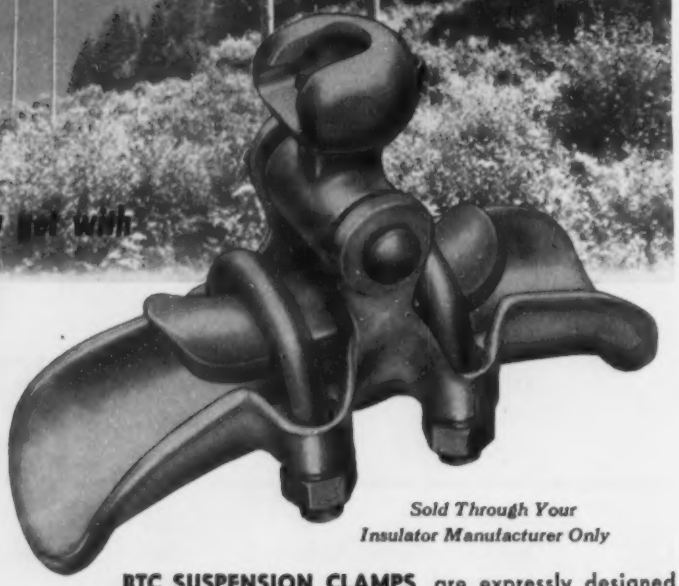
AC ALLIS-CHALMERS

ALLIS-CHALMERS

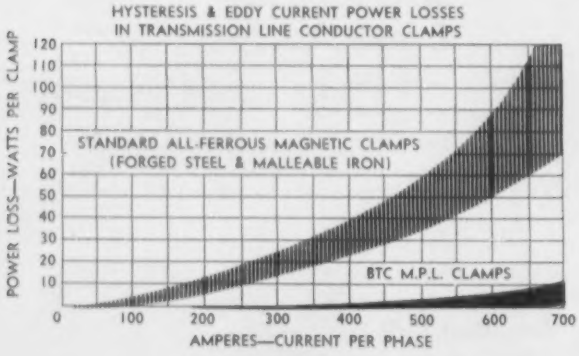


BTC

Drop-Forged M.P.L. Aluminum SUSPENSION CLAMPS



Sold Through Your Insulator Manufacturer Only



BTC SUSPENSION CLAMPS are expressly designed to assure long conductor life. The lightweight and generous longitudinal radius of the conductor seat minimize the effects of conductor vibration. At no point is the conductor bent over a small radius.

CLAMPING PRESSURE is greatest at the center of the BTC Clamp, gradually decreasing toward each upswept end of the keeper. Clamp and Keeper ends are liberally bell mouthed and beaded to prevent conductor damage and formation of corona.

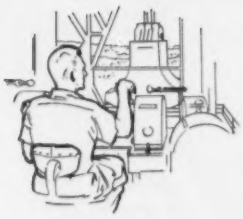
THE CONDUCTOR is fully supported in the clamp body. There are no open pockets at U-Bolt holes to allow distortion of the conductor under clamping pressure.

INCREASED CONDUCTOR LIFE, resulting from the BTC design, is only one of the many advantages these drop-forged M.P.L. Aluminum Suspension Clamps offer. Insist on BTC Clamps the next time you order from your insulator manufacturer.

Drop-Forged BTC *Hi-Line Hardware*

The BREWER-TITCHENER CORPORATION

Cortland, New York



Look at the record!

15-Ton unloaders with EC&M control set new records in unloading time and low maintenance costs at the Baltimore & Ohio, Curtis Bay Ore Pier

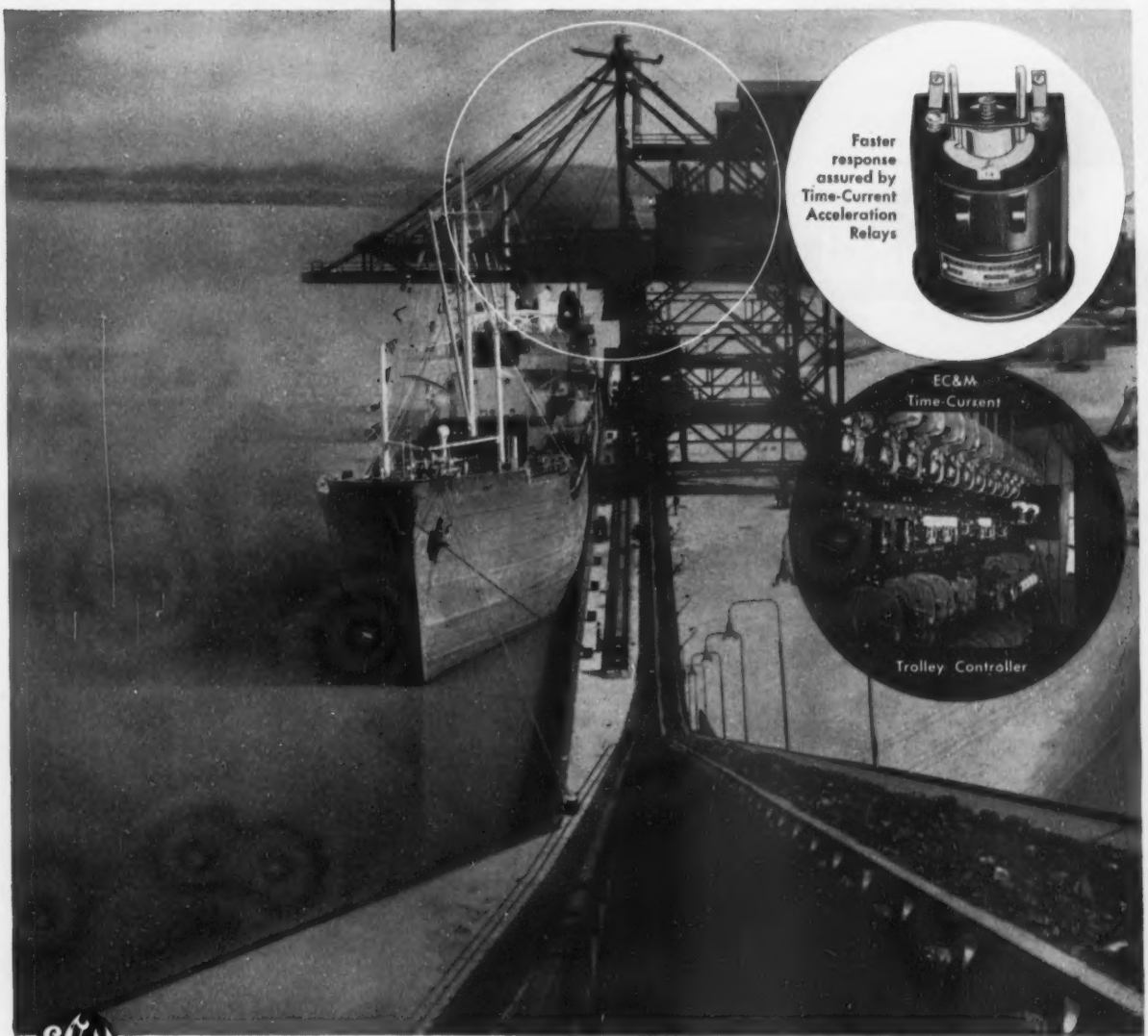
20,560 TONS OF IRON ORE UNLOADED IN 13 HOURS AND 55 MINUTES! Fast-operating EC&M Line-Arc Contactor Control with EC&M Time-Current Acceleration helped establish this record.

EC&M Control Apparatus and Control Engineering also provide outstanding safety during all operations. Power for motor drives is fed through operator's cab for safe, direct control. Dynamic braking for quick trolley stop is automatically applied in end-zones and if power fails. EC&M Quadruplex Controllers insure that the 4 bridge motors share the load equally and that brakes release and set uniformly.

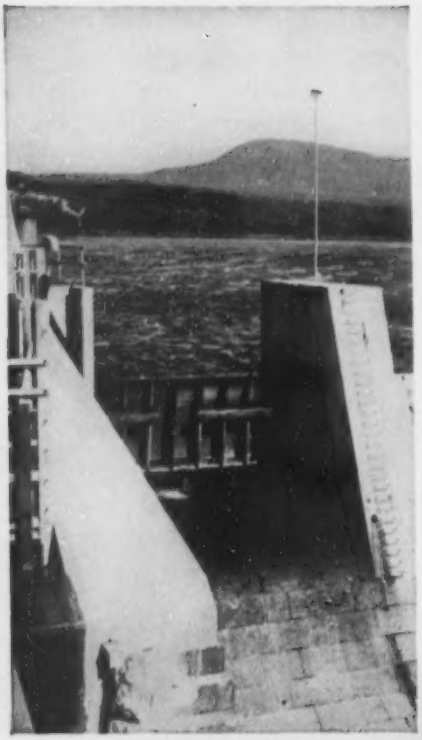
Replacement part cost, in this installation, has been only 25¢ per 1000-tons of ore unloaded over a 3 year period. The record proves that high output with low upkeep is yours when you select EC&M Control.

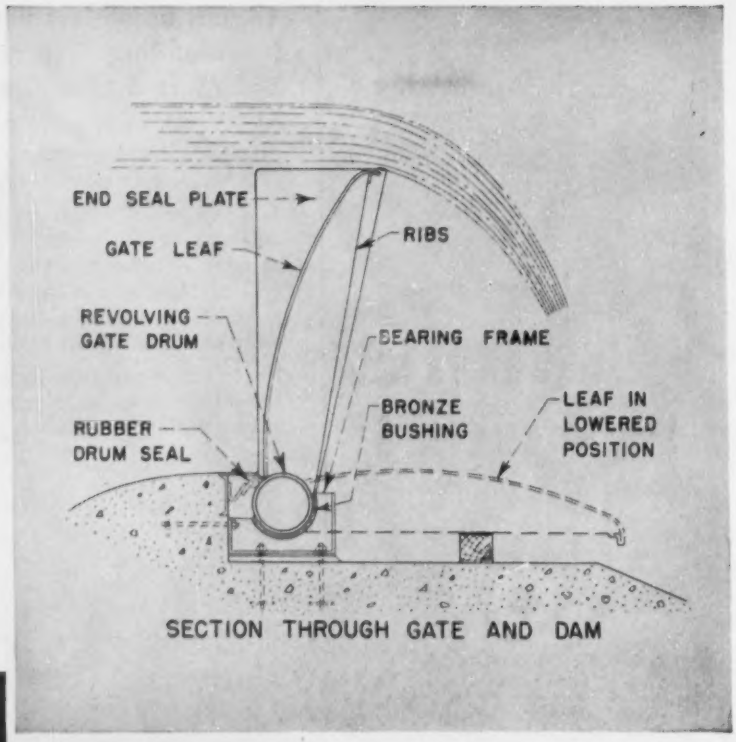
8051

Write today for Bulletin 921-OU



THE ELECTRIC CONTROLLER & MFG. CO. 2698 E. 79th Street • Cleveland 4, Ohio





SMS

BASCULE CREST GATES

DO YOU NEED MORE WATER STORAGE— MORE CONTROL OR SPILLWAY CAPACITY...

Raising the water level is often the most economical way to meet increased demands on water and power supply. This problem can be quickly and economically solved on existing dams with a Bascule Crest Gate. Advantages of the SMS-Bascule are the speed and ease of operation for flood control and for sluicing away debris and ice.

SMS-Bascule Gates are electrically or hydraulically operated by automatic and/or manual controls.

According to your needs, gates can be made in lengths up to 100 ft. and up to 10 ft. in height.

Hydrodynamics has been our specialty for over 75 years. For more information on hydraulic turbines, bascule gates and other accessories, write to the S. Morgan Smith Company, York, Pennsylvania.

Hydraulic Turbines
Pumps
Gates & Hoists
Trash Rakes
Accessories

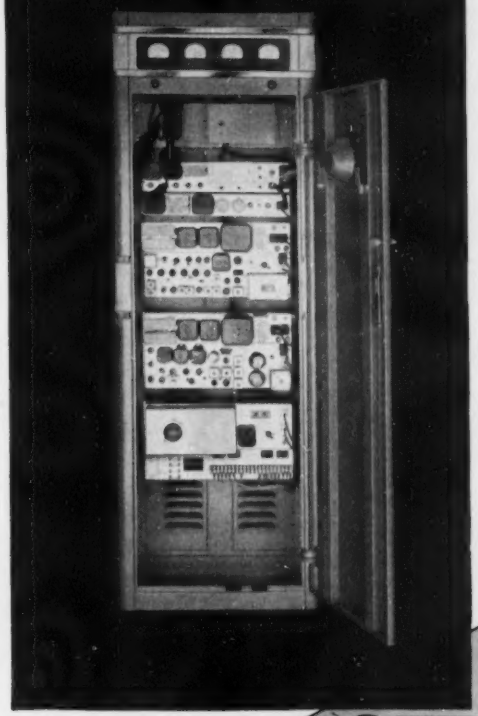
HYDRODYNAMICS

Rotovalves
Ball Valves
Butterfly Valves
Free-Discharge Valves
Controllable-Pitch Ship Propellers

S. MORGAN SMITH CO.

more channels with

Motorola fm power line carrier



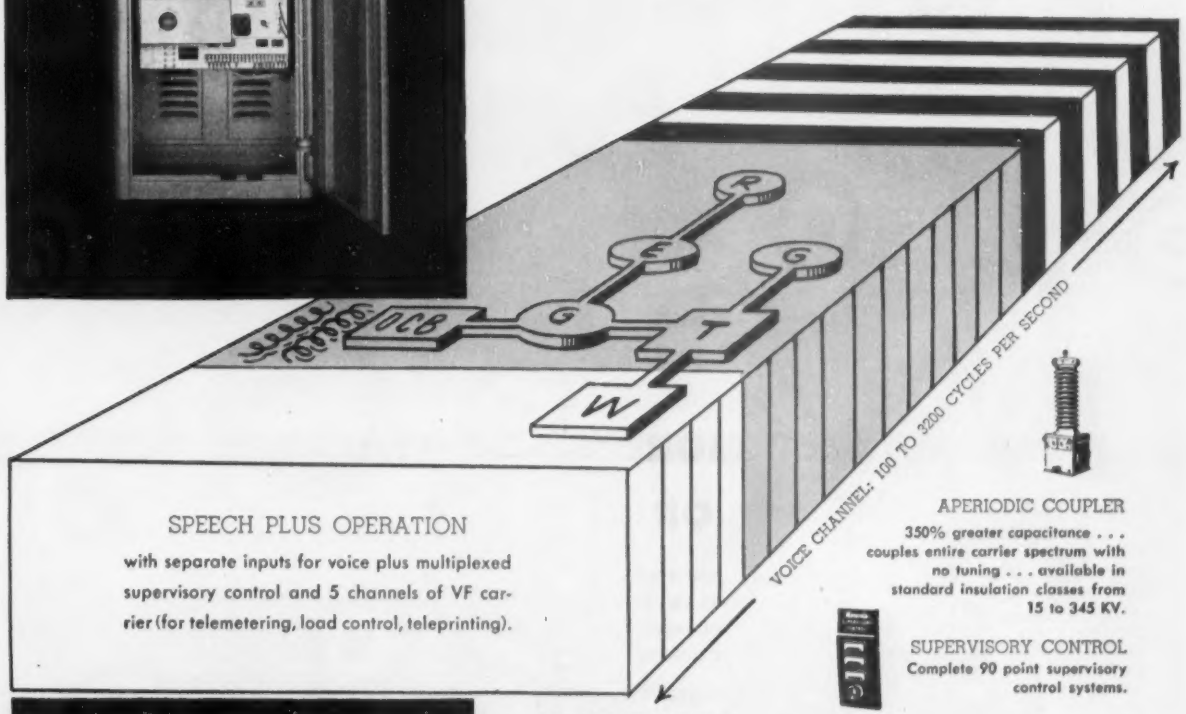
Motorola's superior receiver selectivity assures maximum suppression of spurious responses and maximum utilization of channel space.

Allows minimum channel spacing and maximum frequency utilization at minimum cost.

Frequency modulation provides constant output under varying line conditions and improved operation on noisy circuits.

Available in simplex, duplex and automatic simplex models with

- Carrier Shift Signalling
- Single Scale Metering
- Low Power Drain
- Automatic Modulation Control
- Fast Positive Squelch



SPEECH PLUS OPERATION

with separate inputs for voice plus multiplexed supervisory control and 5 channels of VF carrier (for telemetering, load control, teleprinting).

APERIODIC COUPLER

350% greater capacitance . . . couples entire carrier spectrum with no tuning . . . available in standard insulation classes from 15 to 345 KV.

SUPERVISORY CONTROL

Complete 90 point supervisory control systems.

PARTIAL LIST OF USERS

American Gas & Electric Service Corp.
Brazos River Electric Transmission Corp.
Central Power & Light Company
Central Illinois Public Service Company
Idaho Power Company
Montana Power Company
New England Power Service Company
Ohio Power Company
Southern California Edison Company
Tennessee Valley Authority

MOTOROLA — the complete supplier of radio communications and industrial control, microwave relay, power line carrier, supervisory control, frequency shift V.F. carrier, mobile communications, and telemetering equipment.

write, phone or wire

Motorola

POWER UTILITY PRODUCTS

Motorola Communications & Electronics, Inc.
a subsidiary of Motorola, Inc.
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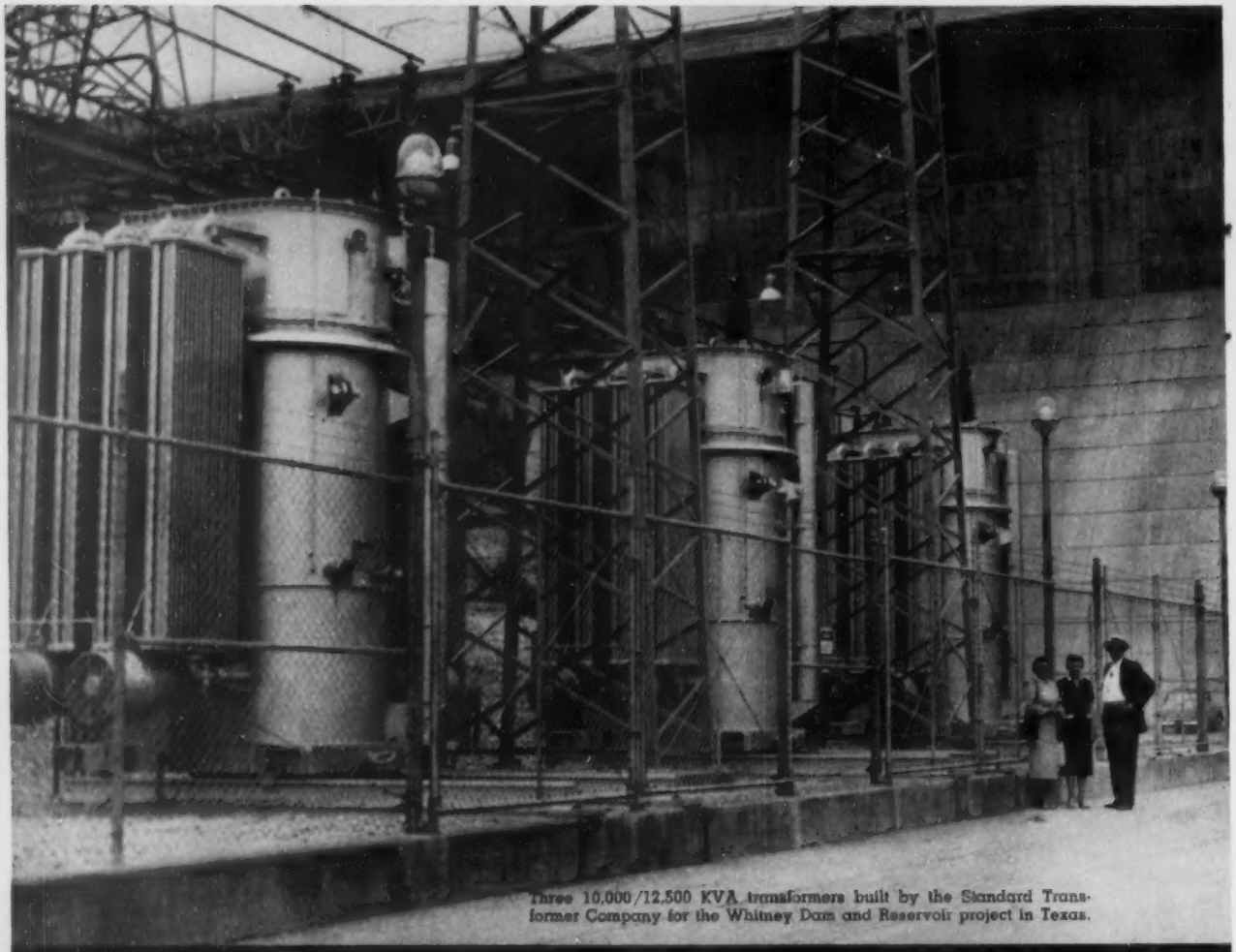
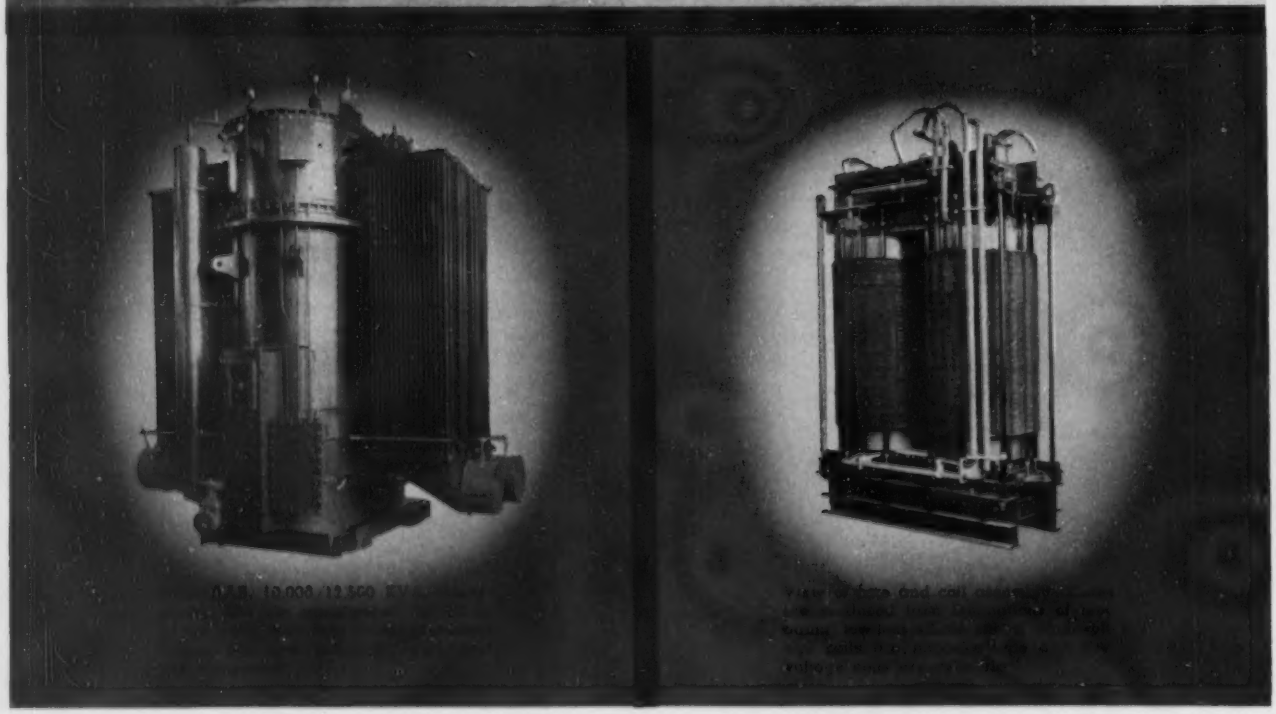


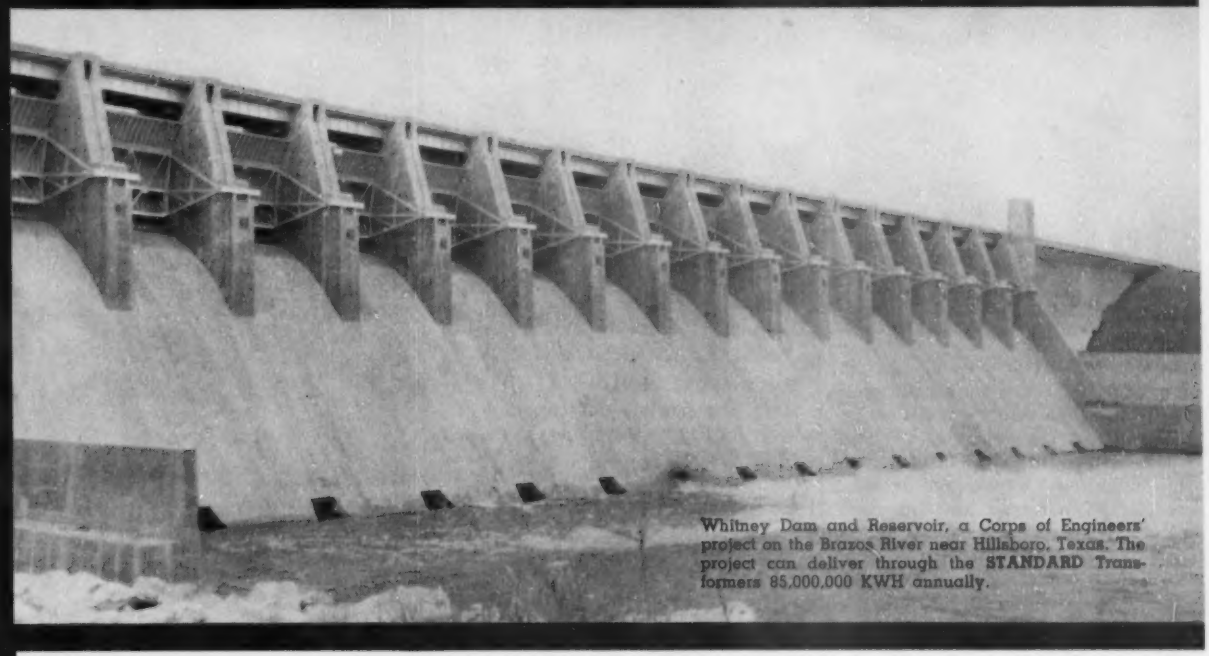
Three 10,000/12,500 KVA transformers built by the Standard Transformer Company for the Whitney Dam and Reservoir project in Texas.



Standard

TRADE MARK ®

builds them EHV for Whitney Dam



Whitney Dam and Reservoir, a Corps of Engineers' project on the Brazos River near Hillsboro, Texas. The project can deliver through the **STANDARD** Transformers 85,000,000 KWH annually.

● There was a time when **STANDARD** built transformers that were no bigger than a pound of butter. Now our engineers take installations like the Whitney Dam and Reservoir project in stride. In the factory, **STANDARD** craftsmen have become accustomed to building large transformers quickly and accurately.

Here are a few statistics. Each 10,000/12,500 KVA transformer at Whitney Dam weighs 40 tons. The transformers are capable of stepping up 13,200 volts to 69,000 volts. They can convert enough power to supply a fair-sized city. There are 2,900 gallons of oil in each, and the elements weigh 40,000 pounds apiece. It takes 6,300 pounds of copper alone for each transformer. They are 18 feet high and are air cooled with fans for 12,500 KVA supplemental rating.

When you have a need for transformers, whether large or small, don't hesitate to call your **STANDARD** representative.

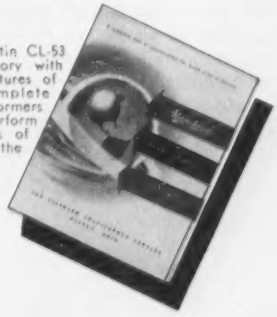
Standard

THE STANDARD TRANSFORMER COMPANY

WARREN, OHIO

REPRESENTATIVES IN PRINCIPAL CITIES

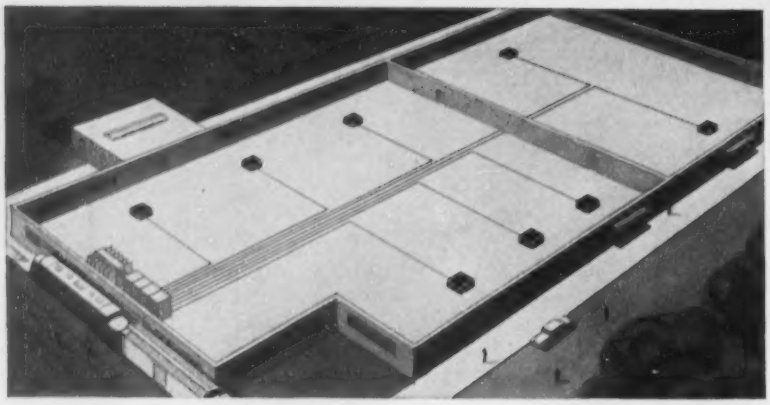
Write for Bulletin CL-53 It tells the story with words and pictures of Standard's complete line of transformers and how they perform for every class of service . . . on the job.



WIRE AND CABLE INFORMATION DIGEST

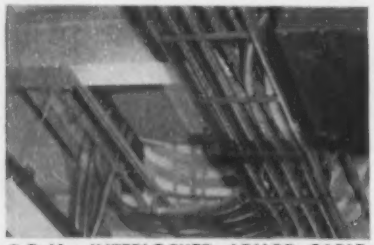
Planned Electrical Modernization

to prepare for growing loads

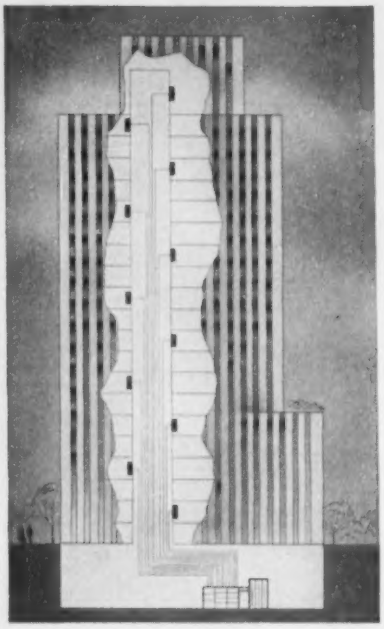


INDUSTRIAL PLANTS. General Electric job-planned cable systems are designed to absorb load increases without major modifications. For example, a feeder system of flexible G-E interlocked armor cables will let you add or relocate circuits easily, as loads increase and circuit requirements change. For incoming leads and primary feeders buried directly in the ground, installed in underground ducts, or in conduit, G-E Super Coronol* cable's normal rating (85 C up to 15,000 volts) and its emergency rating (up to 115 C depending on the voltage) give you reserve capacity.

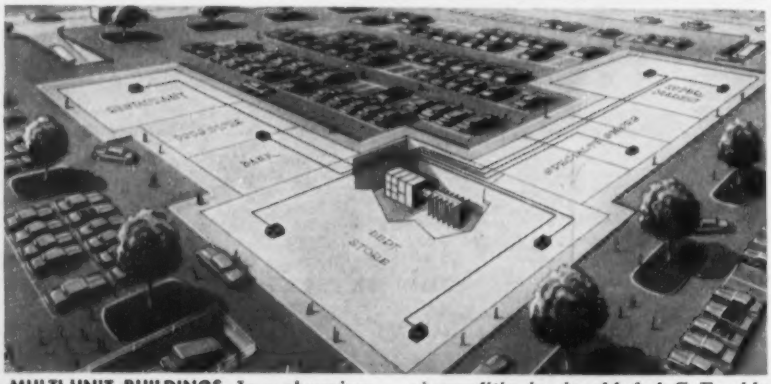
*Registered Trade-mark General Electric Company



G-E V-c INTERLOCKED ARMOR CABLE primary or secondary feeder systems can be installed quickly, and can be easily expanded or relocated to accomodate changes in load patterns—because each circuit is a separate, flexible cable that needs no conduit.



MULTI-STORY BUILDINGS. Growing loads here can be met by running primary feeders up the service shaft, and stepping down to utilization voltage on the upper floors.



MULTI-UNIT BUILDINGS. In a shopping center, power requirements often change drastically—for example, when air conditioning is added. A G-E cable system, planned for flexibility, solves the problem.

For help in planning a cable system

that allows for future expansion, write for these helpful booklets on G-E cables, or call the G-E wire and cable specialist in your locality. Section W134-1027, Construction Materials Division, General Electric Company, Bridgeport 2, Conn.

REWIRE AMERICA ... WITH GENERAL ELECTRIC WIRING SYSTEMS

Progress Is Our Most Important Product

GENERAL ELECTRIC

Here's why the Ljungstrom saves fuel...improves boiler performance

1. Saves Fuel — Savings are roughly 1% for every 45-50°F of preheat, since this heat has been recovered in usable form from flue gases.

2. Increases Boiler Output — Preheating combustion air increases boiler furnace temperature. Heat absorption into boiler tubes increases at the same time, raising the unit's capacity to produce steam.

3. Increases Boiler Reliability — Preheating leads to more complete combustion of fuel; therefore, less slagging. By burning fuel more completely, it helps boilers stay on the line longer. Furthermore, gases to dust recovery units are cleaner.

4. Permits Use of Lower Grade Fuels — Saw and paper mill refuse, wood, lignites, peat, bagasse and similar low-grade fuels become commercially practical when preheated combustion air is used.

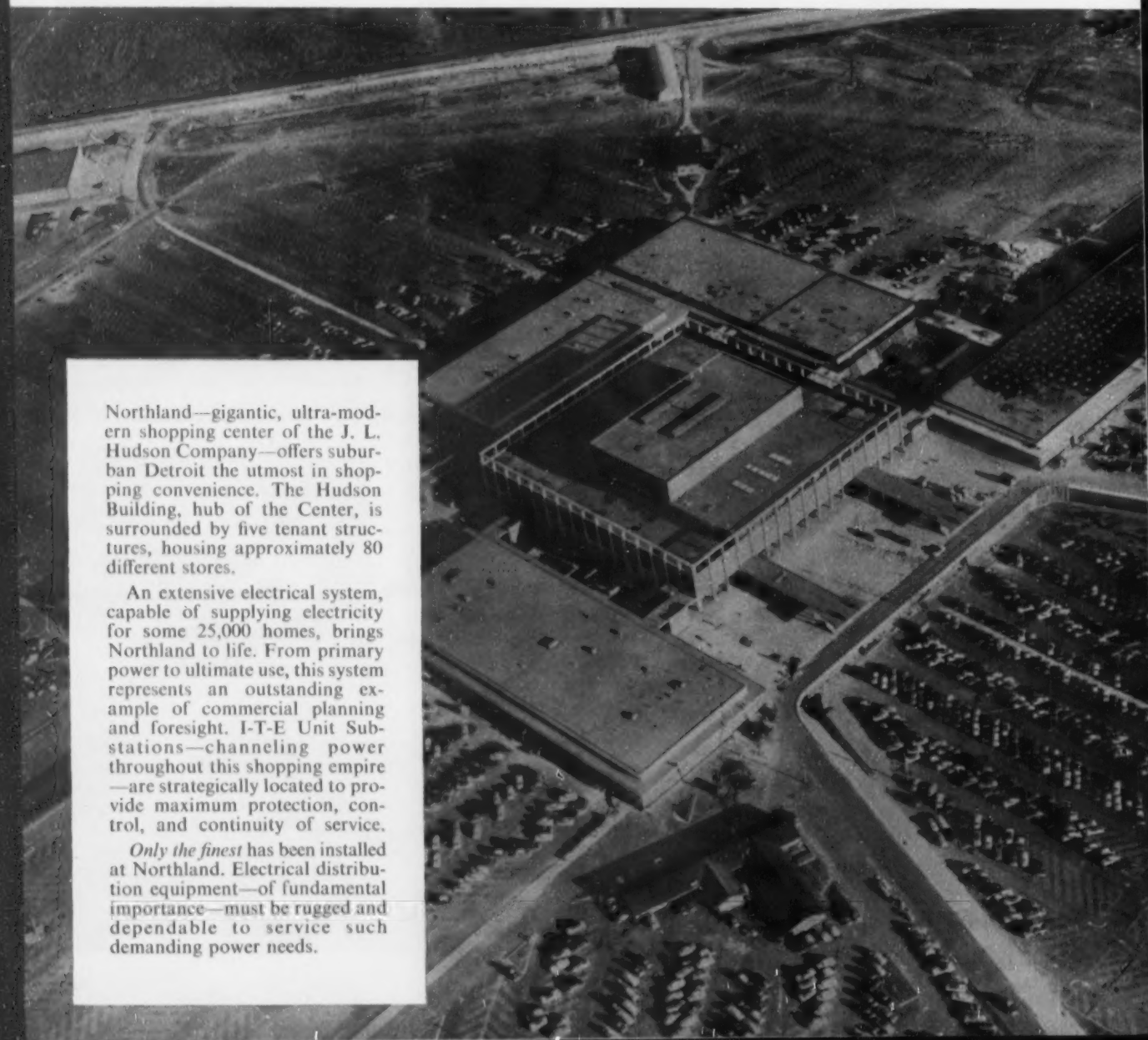
The Ljungstrom® Air Preheater . . . used in seven out of ten large boiler installations—is the most compact, reliable and versatile preheater available. Installed in a boiler, it leads to the four well-known advantages listed at the left.

Remember: the ability to deliver these important benefits in full measure is an important reason why more than twice as many Ljungstrom Air Preheaters are specified for large boilers than all other types combined.

WHEREVER YOU BURN FUEL, YOU NEED LJUNGSTROM

The Air Preheater Corporation 60 East 42nd Street, New York 17, N. Y.

Servicing the Power needs of the world's largest shopping center



Northland—gigantic, ultra-modern shopping center of the J. L. Hudson Company—offers suburban Detroit the utmost in shopping convenience. The Hudson Building, hub of the Center, is surrounded by five tenant structures, housing approximately 80 different stores.

An extensive electrical system, capable of supplying electricity for some 25,000 homes, brings Northland to life. From primary power to ultimate use, this system represents an outstanding example of commercial planning and foresight. I-T-E Unit Substations—channeling power throughout this shopping empire—are strategically located to provide maximum protection, control, and continuity of service.

Only the finest has been installed at Northland. Electrical distribution equipment—of fundamental importance—must be rugged and dependable to service such demanding power needs.

at Detroit's

NORTHLAND PROJECT

vital energy for a shopping wonderland
supplied by I-T-E dry-type, double-ended Unit Substations

Eleven I-T-E metal-enclosed Unit Substations, rated 1500 and 2000 kva, service the Center's immense lighting and power requirements. And to assure service continuity, Northland's electrical system features I-T-E Selective Tripping devices on the circuit breakers, which *isolate* system faults by interrupting only the circuit nearest the fault.

From the start, important engineering aid was given Northland by I-T-E application engineers. Thanks to this close cooperation, power distribution equipment was on hand *when needed* to fit right in with tight construction schedules.

I-T-E is proud of its place as a *major* contributor of quality power distribution equipment for the "world's largest shopping center."

AT NORTHLAND—

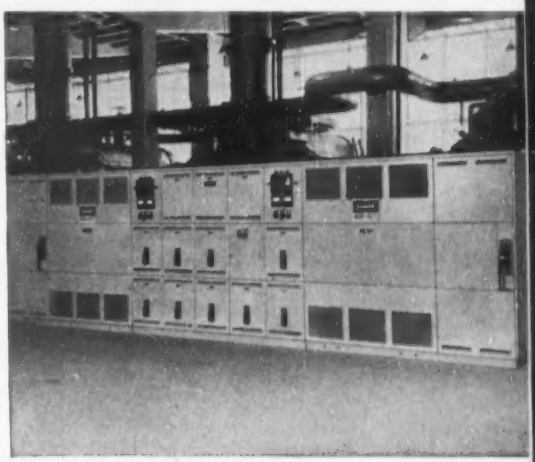
I-T-E Substations service:

interior lighting	**escalators**
exterior lighting	**pumps & blowers**
display lighting	**air conditioning**
elevators	**compressors**
conveyors	**refrigeration**

For details contact the I-T-E field office nearest you. Look in your classified directory under "Electric Equipment."

I-T-E UNIT SUBSTATIONS
service all interior lighting needs of the Center.

I-T-E UNIT SUBSTATIONS
installed in basement of Hudson Building for 4800—120/208 volt lighting distribution.



I-T-E UNIT SUBSTATION
installed in Utility House for 4800—480 volt power distribution.

THE SYMBOL OF QUALITY SWITCHGEAR

I-T-E CIRCUIT BREAKER COMPANY

19TH AND HAMILTON STREETS, PHILADELPHIA 30, PA.

UNIT SUBSTATIONS

8 I-R BOILER FEED PUMPS serve large Southwest utility

... and 3 MORE are on order!

ONE good pump deserves another. And so it grows--the record of repeat orders for I-R pumps.

Here, for example, is a large Southwest utility where the consulting engineers specified and installed *eight* Ingersoll-Rand "double-case" boiler feed pumps and ordered three more—all within a four year period. What better proof of satisfactory on-the-job-performance!

The first three CHTB pumps, shown in the smaller photo and installed in 1949, are 7-stage units rated 537 gpm at 929 psig serving two 18,750 kw generating units. The two additional CHTBs illustrated, installed in 1951, are each rated 1090 gpm, 906 psig, supplying 50,000 kw of generating capacity. At another plant in this utility's system, three I-R boiler feed pumps, rated at 1440 psig, are installed on the present 100,000 kw unit and three more are on order for a 156,000 kw addition planned. They will be rated 1545 gpm, 1918 psig.

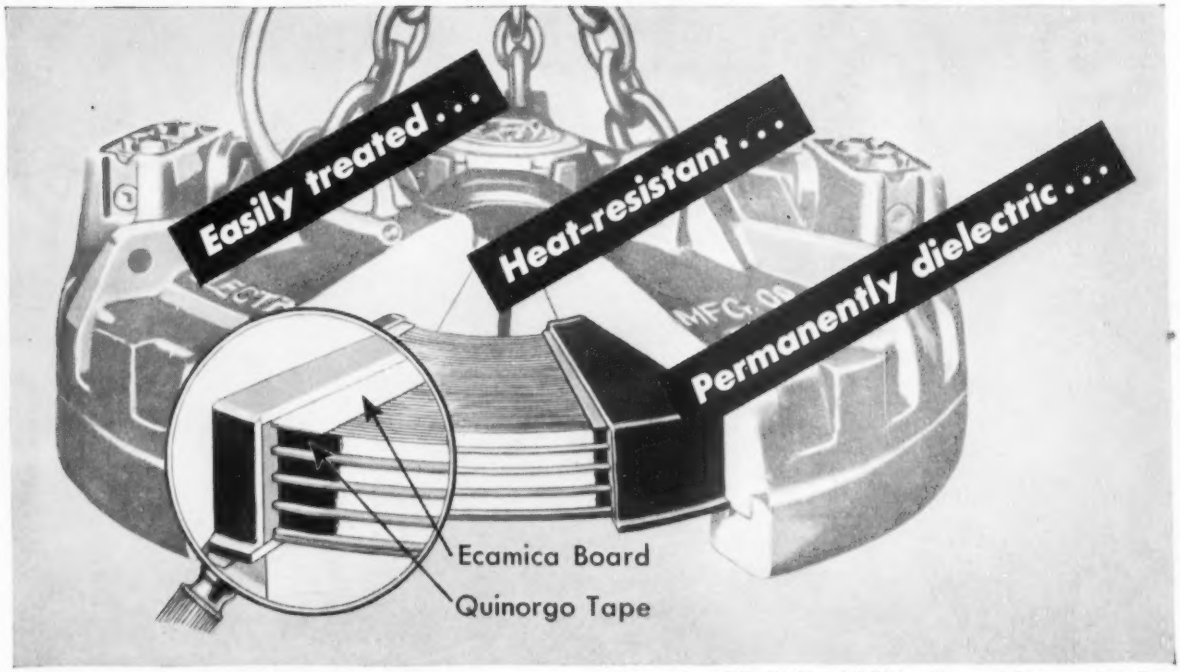
When it comes to high pressure boiler feed—or any *other* power plant pumping problem – make sure of service-proved performance by specifying Ingersoll-Rand. Your I-R representative will be glad to serve you in any way.

10-103

Ingersoll-Rand

CAMERON PUMP DIVISION
11 BROADWAY, NEW YORK 4, N. Y.

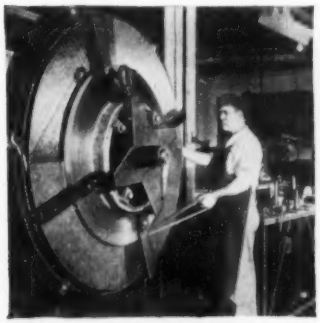
COMPRESSORS • AIR TOOLS • ROCK DRILLS • TURBO-BLOWERS • CONDENSERS • CENTRIFUGAL PUMPS • DIESEL AND GAS ENGINES



Cutaway view of EC&M's Type SW Lifting Magnet: Coil layers and windings are protected with J-M Quinorgo and Quinorgobord base insulations.

3 important reasons why both Quinorgo® and Quinorgobord® are used in EC&M magnets

Quinorgobord No. 1100 is impregnated and laminated by special EC&M processes into their ECAMICA Boards for coil layer insulation.



Quinorgo Tape No. 3000 is impregnated with compounds developed by EC&M and wet wound simultaneously with strap copper.

AFTER MANY TESTS of materials available, The Electric Controller & Mfg. Co., Cleveland, Ohio, selected both Johns-Manville Quinorgo and Quinorgobord, for use in their all-welded lifting magnets.

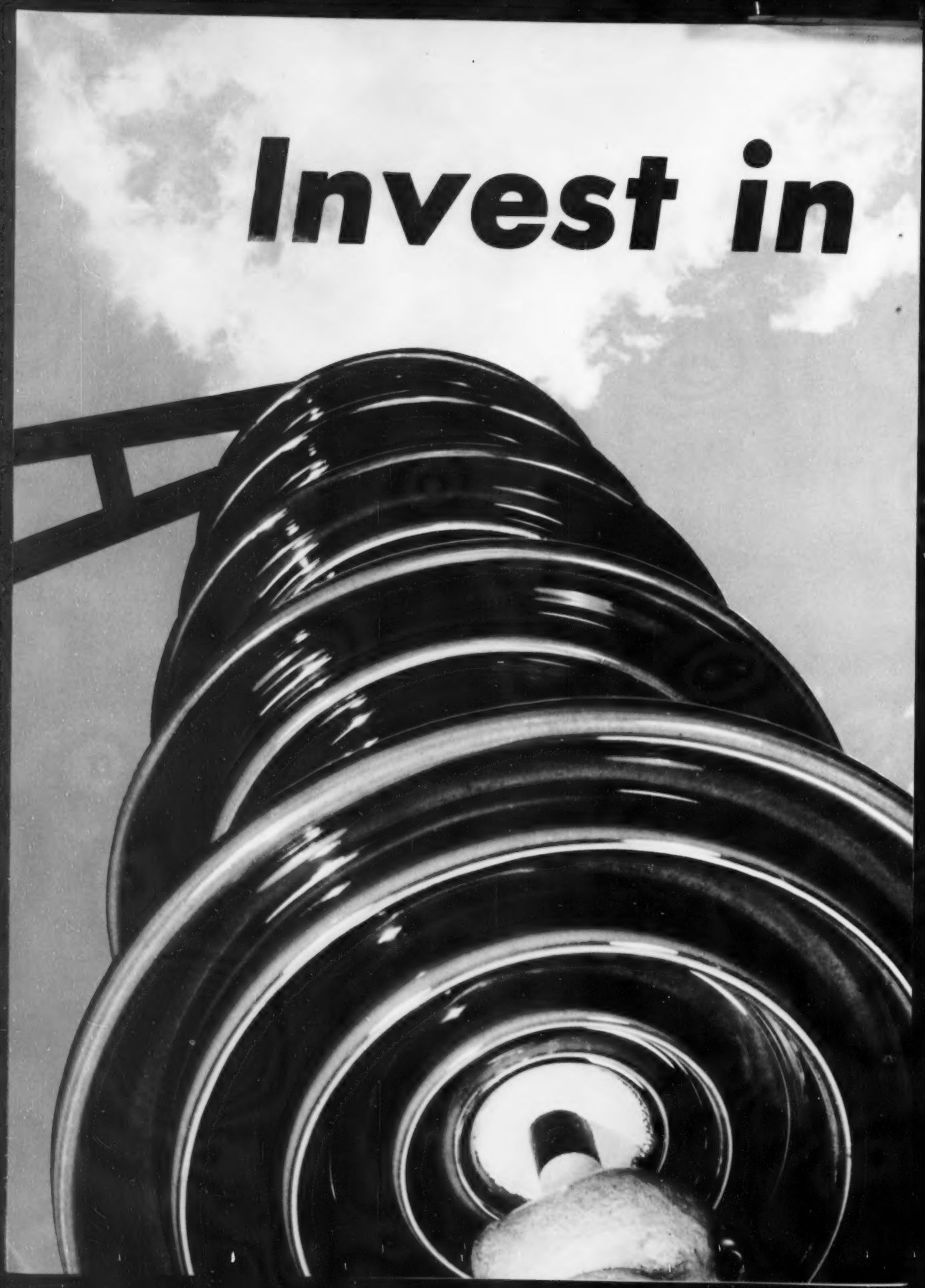
These materials provided the desirable and efficient mechanical and electrical properties needed for magnet duty. Each remains dielectrically stable under heat. Both are exceptionally free from magnetic particles and low in moisture content. Especially designed for treatment with other dielectrics, they are tough, relatively moisture-free, base materials.

No. 3000 Quinorgo Tape insulates the strap wound coils. Its excellent space factor permits a higher number of turns of copper, resulting in greater lifting power. By a special EC&M process, No. 1100 Quinorgobord (a board-like sheet) is treated and combined with Mica to form ECAMICA* board. This, they use between the coil layers.

Other leading manufacturers, processors and laminators also find that these moderate-priced J-M pyrolysis-resistant electrical insulations help cut costs, improve insulation performance and lengthen service life of equipment. For complete information, write for booklet EL-40A. Address Johns-Manville, Box 60, New York 16, N. Y. In Canada, 199 Bay Street, Toronto 1, Ontario.

Registered Trade Mark of Electric Controller & Mfg. Co.

Johns-Manville
ELECTRICAL INSULATIONS


Invest in

Protection

against mechanical impact

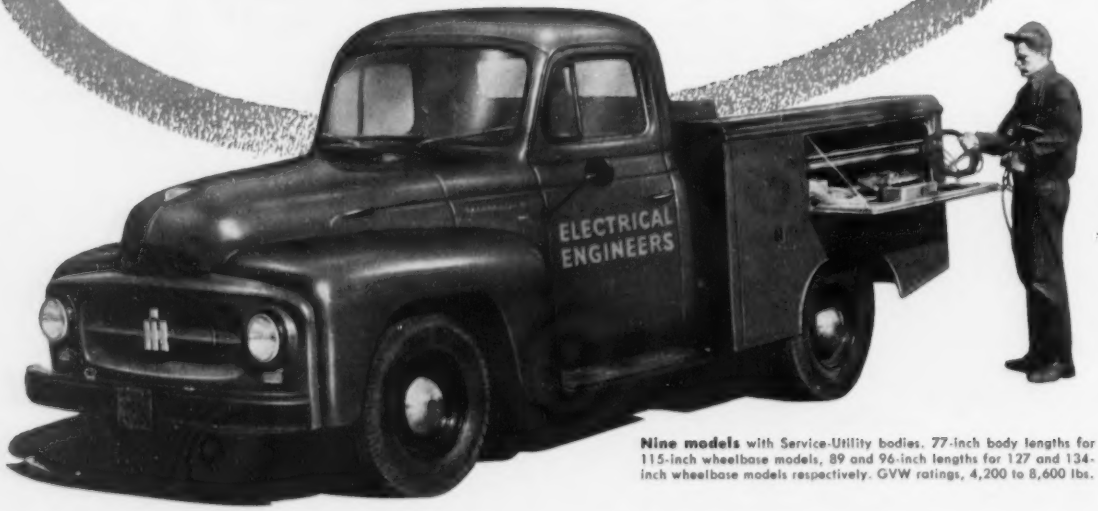
Get Locke **MICROGLAZE*** Suspension Insulators

LOCKE

LOCKE DEPARTMENT
GENERAL ELECTRIC COMPANY
BALTIMORE, MARYLAND

*Trademark of General Electric Company

Trip saver...
Time saver...
Money saver



Nine models with Service-Utility bodies. 77-inch body lengths for 115-inch wheelbase models, 89 and 96-inch lengths for 127 and 134-inch wheelbase models respectively. GVW ratings, 4,200 to 8,600 lbs.

An INTERNATIONAL Truck with Service-Utility body is one of the best ways ever figured out for reducing job installation and service call costs.

Take a look at the truck, first of all. It is built with the stamina that has made INTERNATIONALS famous for extra long life, extra-low maintenance. It has an INTERNATIONAL-built Silver Diamond engine—an *all-truck* engine of modern, low friction valve-in-head design, with every feature for utmost operating economy. It gives you a roomy, driver-designed Comfo-Vision cab—easy riding and handling—time-saving maneuverability—round-the-clock dependability.

Now look at the Service-Utility body. It is designed to save you trips and time. It has locking, all-steel compartments of various sizes that let you take all needed parts, tools, and equipment to the job on the first call. No more job-to-shop trips for forgotten items! No more wasted labor time! And it's available with pipe supports, vise bracket, and ladder rack to give you complete equipment for all kinds of work.

Let your INTERNATIONAL Dealer or Branch show you why this extra-efficient workshop truck is your all-around best bet for saving trips, time, and money. Time payments arranged, of course.

INTERNATIONAL HARVESTER COMPANY • CHICAGO

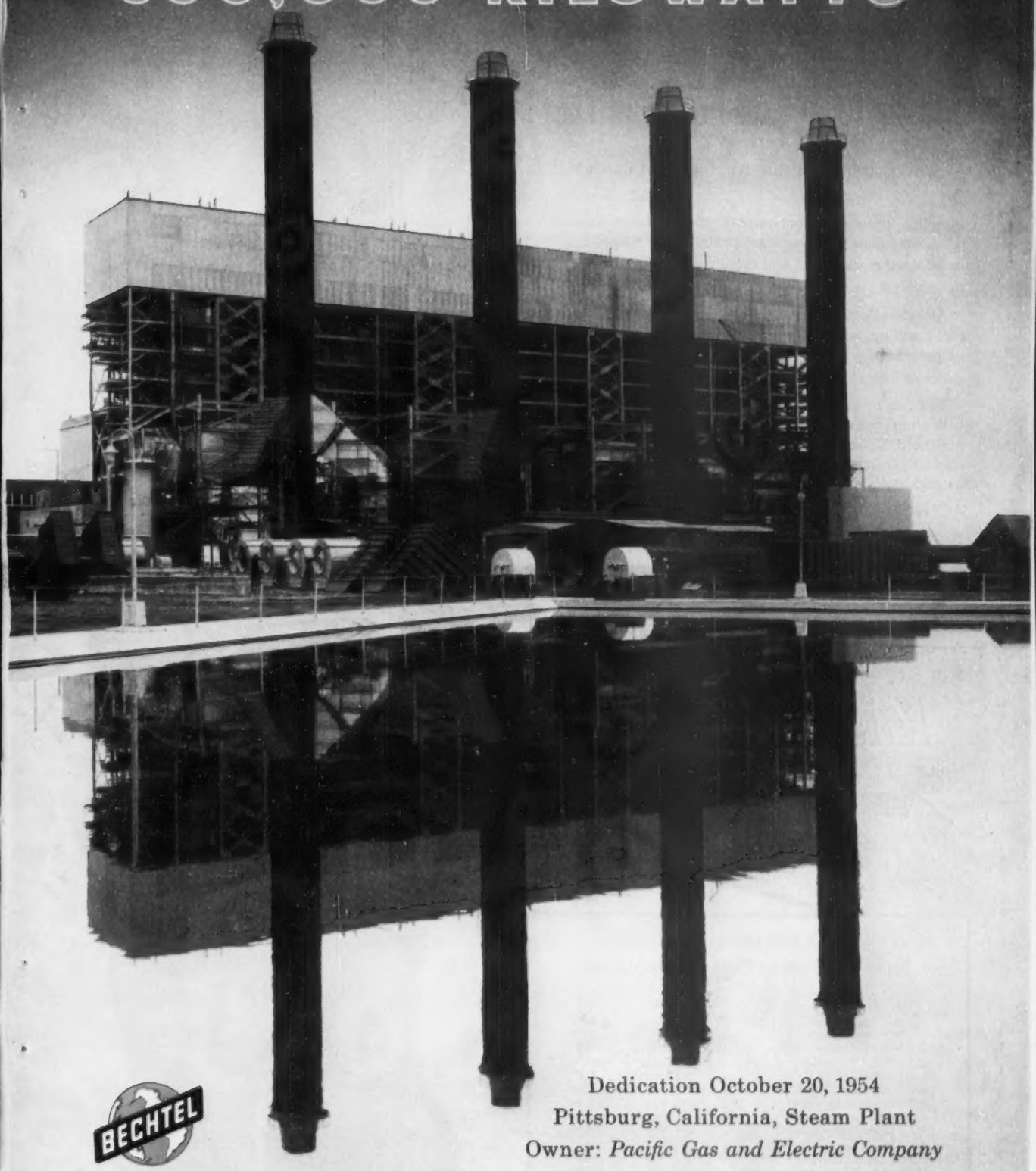
International Harvester Builds McCormick® Farm Equipment and FARMALL® Tractors...Motor Trucks...Industrial Power...Refrigerators and Freezers

Better roads mean a better America

INTERNATIONAL® TRUCKS

"Standard of the Highway"

600,000 KILOWATTS



BECHTEL

BUILDERS FOR INDUSTRY

Dedication October 20, 1954

Pittsburg, California, Steam Plant

Owner: *Pacific Gas and Electric Company*

DESIGN • PROCUREMENT • CONSTRUCTION

BECHTEL CORPORATION

Los Angeles • SAN FRANCISCO • *New York*

SAVE

$18.00 TO $85.64 PER 1000 FEET!

with Kaiser Aluminum Weatherproof Conductor

Simply by converting from copper to Kaiser Aluminum weatherproof conductor you save from $18.00 to $85.64 per 1000 feet in *material costs alone!* And there are *other* important potential savings!

Aluminum's light weight permits easier, faster stringing—cuts handling and installation costs. In addition, reduced strains on pole, homes and fittings greatly lower the cost of maintenance and repair.

You can be sure of getting the *maximum* savings possible with aluminum conductor by specifying Kaiser Aluminum. Experienced Kaiser Aluminum field engineers work with your crews right in the field where desired, demonstrate ways to speed installations and cut costs.

ACT NOW—as hundreds of power companies are doing! Convert to Kaiser Aluminum conductor easily, efficiently, economically—and save thousands of dollars a year. Complete field and engineering services at no obligation. Contact the Kaiser Aluminum sales office listed in your telephone directory or one of our many distributors. Kaiser Aluminum & Chemical Sales, Inc. *General Sales Office,* Palmolive Bldg., Chicago 11, Ill.; *Executive Office,* Kaiser Bldg., Oakland 12, California.

Kaiser Aluminum

THE NATION'S LARGEST PRODUCER OF TRIPLEX AND ALUMINUM WEATHERPROOF CONDUCTOR

Estimate your savings with these Kaiser Aluminum weatherproof conductors:

	Per 1000 Ft. Lbs.	Cost
#6 Solid Copper TBWP*	112	$ 44.50
#4 Solid Alum PE (2/64)	48	26.50
#4 Solid Alum Neo (3/64)	64	26.50
#2 7 Strand Copper TBWP*	270	107.00
1/0 7 Strand Alum PE (4/64)	141	69.60
1/0 7 Strand Alum Neo (4/64)	172	69.60
2/0 7 Strand Copper TBWP*	522	195.91
4/0 7 Strand Alum PE (4/64)	261	136.00
4/0 7 Strand Alum Neo (4/64)	306	136.00
4/0 7 Strand Copper TBWP*	800	298.64
336400 CM, 19 Str. Alum PE (4/64)	388	213.00
336400 CM, 19 Str. Alum Neo (5/64)	469	228.00

May 6, 1954 prices based on 30,000#—F.O.B. Destination
*URC Copper Triple Braid Weatherproof

it's time for a new meter...

when Mrs. Riley...

gets her electric range

Since the day she took up the role of homemaker, Edith Riley has had a gas stove, of one kind or another, in her kitchen. But times have changed, and, well . . . the Rileys are getting an electric range this time.

The Rileys, and the thousands of American families like them who are turning to electricity to do more and more things, are going to need high capacity meters.

There is a new extended range meter on the market that will easily handle the heavier loads created by the rapidly increasing use of electricity. It's the Sangamo J2, a 15 ampere meter with straight-line accuracy up to 100 amperes. As a matter of fact, the J2 has the capacity to carry 100 amperes *continuously* without overheating, yet it has sufficient torque to accurately measure even the lightest load.

When you invest money in meters you know are going to have to handle greater and greater loads, protect your investment by choosing a meter with plenty of reserve ability to measure the growing use of electricity.

Choose the new Sangamo J2—the first . . . and finest . . . 15 ampere meter with 100 ampere capacity.

A METER WITH STRAIGHT LINE ACCURACY

UP TO 100 AMPERES

SANGAMO
ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS

JM54-7

"It costs us only 34¢ for every $1.00 of new revenue commercial cooking brings in!"

... Carl T. Bremicker, Vice President, In Charge of Sales, Northern States Power Co., Minneapolis, Minn.

What is new E.A.R. worth? Many utility executives often use the rule-of-thumb that says you can spend $1.00 to get $1.00. But up at the Minneapolis headquarters of Northern States Power, the records show that an all-out drive for commercial cooking load is building a *whole new business* for this great Minnesota utility—and at a cost of just 34c per new $1.00 of E.A.R.

"In 1950," points out vice president Carl T. Bremicker, "E.A.R. from commercial cooking totalled $60,000. Our determination to go after the market with trained manpower and aggressive promotion brought that figure up to over half a million dollars in 1953, and we'll pass the $1,000,000 mark by the end of 1955!"

How Can You Promote Commercial Electric Cooking In Your Territory?

Yes, a great potential exists in commercial cooking. However, maximum returns require *thorough* promotion. Here are the essentials of Northern States Power's program:

- calls and *repeat* calls on food service operations.
- display and demonstrations.
- sales contests.
- training courses for company and dealer salesmen.
- trial use of counter line equipment.
- free service for one year on equipment sold.

Results? 75% of all trial equipment was sold—for an increase of 2.85 kw per operator!

"It's surprising that the profit potential in commercial cooking needs to be advertised ..."

J. Roscoe Furber, Gen. Sales Mgr.

"... because we know of so many utilities that have been so tremendously successful in commercial cooking promotion that we assumed it already had universal recognition as an indispensable building medium."

"Year 'round promotion makes commercial cooking big business!"

Walter E. Gilbert, Manager, Industrial Sales

"Unlike lighting, refrigeration and air conditioning, commercial cooking doesn't *have* to go electric! If we eased up on commercial cooking promotion tomorrow (which we have no intention of doing!), new revenues would soon slip back to old levels, because there is real competition for this load. Its characteristics are very nearly ideal."

"Promotion program to be enlarged, public service to be continued in 1954!"

John C. Newhouse, Supervisor, Industrial Sales

"Much of our commercial cooking market is still untapped. As a result, we intend to enlarge our promotion even further next year. And while we are adding kw's, this program helps our customers increase their profits, too! For instance, the Dutch Mill Night Club, Minot, North Dakota, replaced two competitive 110-lb. fry kettles with one 28-lb. capacity Hotpoint Mark 313 electric frying machine, at a savings of $45.00 a month in fat alone!"

YOU CAN MATCH THE NSP SAGA

The time is now. Why not share our commercial cooking services and programs? Write and I will give your letter my personal attention.

Orrin E. Wolf.

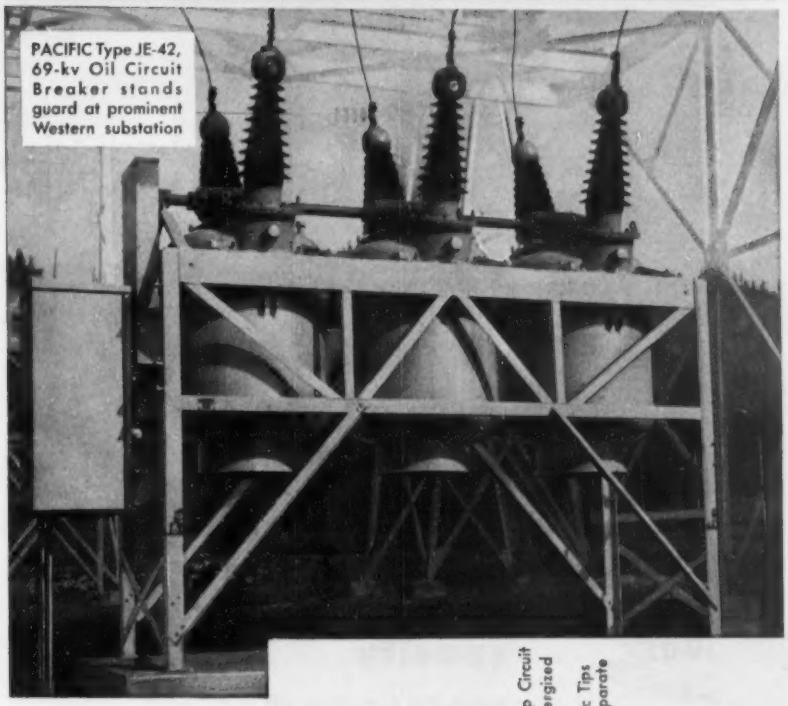
Orrin E. Wolf, Vice President, Hotpoint Co.

Hotpoint ALL ELECTRIC Commercial Cooking Equipment

Hotpoint Co. A Division of General Electric Company

Commercial Equipment Department, 265 South Seeley Avenue, Chicago 12, Illinois

Advanced 69-kv Protection ...Blade-Travel Chart Shows Why



PACIFIC Type JE-42, 69-kv Oil Circuit Breaker stands guard at prominent Western substation

PACIFIC ELECTRIC

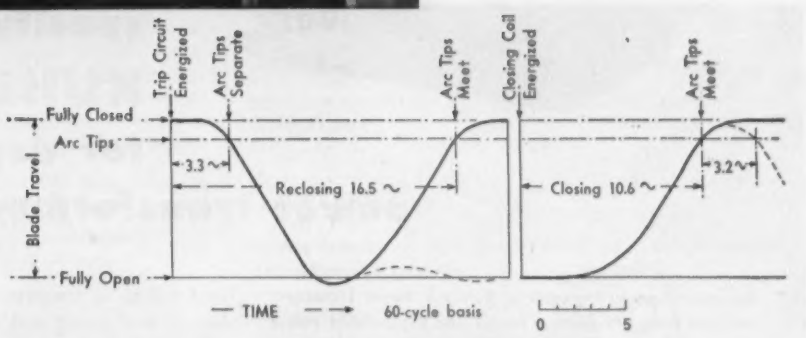
Type JE-42
Frame-Mounted

CIRCUIT BREAKERS

ELECTRICALLY and
MECHANICALLY TRIP-FREE
IN ANY POSITION

NEMA and ASA STANDARD

	Continuous	Interrupting
69 kv	600 amp	1,000,000 kva
(Also other styles	1200 amp	1,500,000 kva
7.5 to 230 kv)	1200 amp	2,500,000 kva



At right: **Blade-Travel Diagram (tanks filled with oil)**

Open and immediate reclose shown at left of chart. Note full opening. Normal close shown at right. Dotted alternate shows start of opening after closing against fault.

THE APPLICATION Engineer needs only to glance at the blade-travel chart of the Pacific Type JE-42 to know that here is something special and out of the ordinary in 69-kv breakers.

The fast opening and reclosing holds system disturbance to a minimum in the case of both transient and permanent faults, and the fact that reclosing is from fully open position assures no impairment of insulation during the critical surge time that follows an interruption caused by repetitive lightning.

The short normal closing time as well as the reclosing time is maintained constant regardless of variation or loss of control voltage. Consequently when closing against fault there can be no slow drift-in of blades which might result in electromagnetic blow-back of blades far enough to open the a-auxiliary switch in the tripping circuit before the relays can operate. Simmering arcs are thereby avoided.

The interior construction also exhibits other advanced features that contribute to reliability of operation, as well as to ease of adjustment and low maintenance cost. Catalog 550 tells about them.

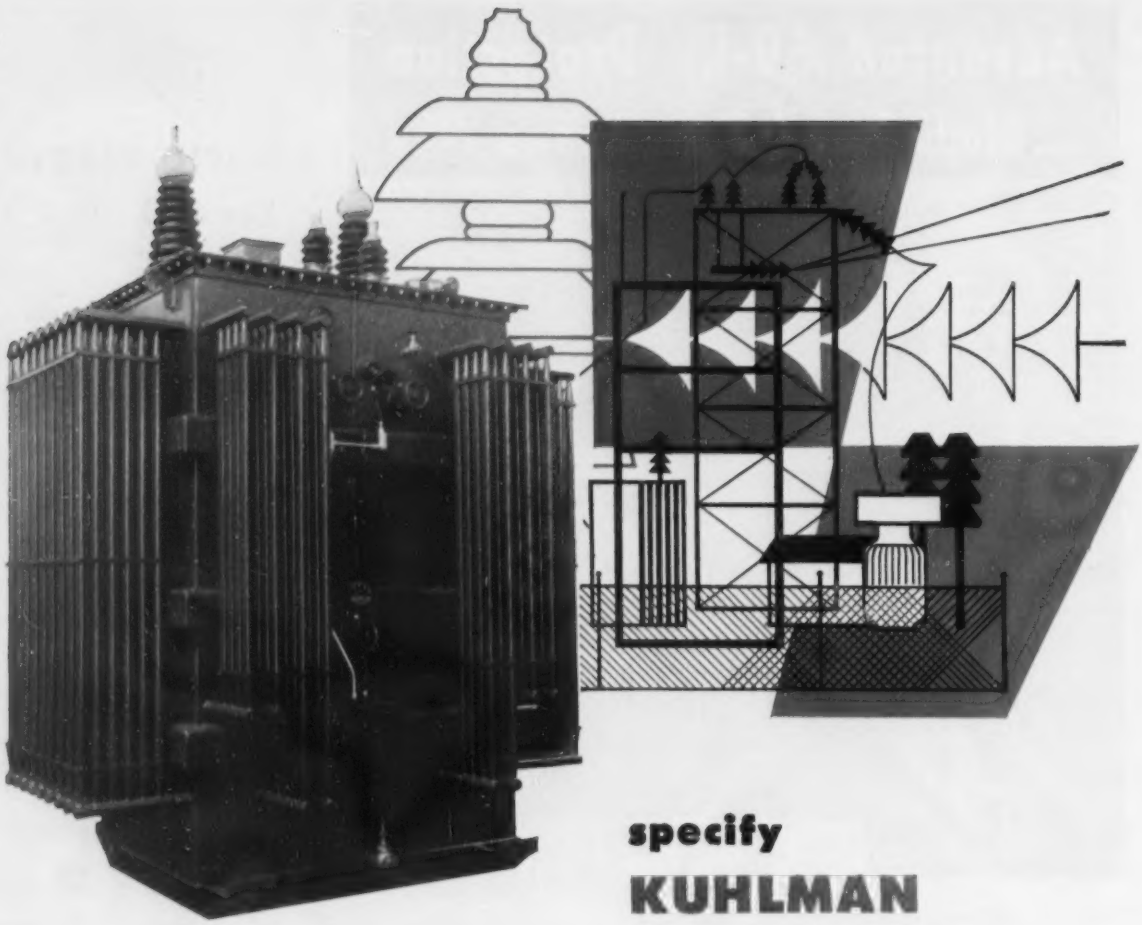
Since 1906

SALES OFFICES or AGENCIES
in PRINCIPAL CITIES

PACIFIC ELECTRIC SWITCHGEAR DIVISION

FEDERAL PACIFIC ELECTRIC CO.

5815 THIRD STREET • SAN FRANCISCO 24 • CALIFORNIA



specify KUHLMAN for dependable power transformers

For more than half a century, Kuhlman Power Transformers have been providing a steady and dependable source of power for American utilities and industry. Built from finest quality materials and engineered for safe, economical operation, these units incorporate the latest design principles, many of which were developed by Kuhlman. Coils are dried under heat in vacuum to insure uniformly high insulation strength and then impregnated with thermosetting varnish to provide good mechanical strength. Insulation is coordinated to the basic impulse level. Windings are equipped with wide oil ducts for insulation and ample cooling. Oil is introduced under vacuum to prevent entrapment of air and insure high insulation strength. Construction throughout is sturdy and rigid. Structural steel core clamps hold the core securely in place to prevent shifting or vibration and provide support for coil braces, lead guides and terminal structures. Tanks are constructed of heavy steel plate, and sealed to minimize deterioration of oil.

Kuhlman Power Transformers are assembled by men who are highly skilled in the electrical crafts. They are thoroughly inspected and tested to meet rigid quality standards. Kuhlman Power Transformers can be produced in a wide variety of ratings, with accessories to suit the specific needs of utilities and industries. For complete information, write for Bulletin CS-601. Kuhlman also builds Distribution, Dry Type, Saf-T-Kuhl, Subway, CSP and Series Street Lighting Transformers. Bulletins are available on these models as well.

151-T

KUHLMAN

KUHLMAN ELECTRIC COMPANY, BAY CITY, MICHIGAN • Southern Division, CRYSTAL SPRINGS, MISSISSIPPI

EXPORT REPRESENTATIVE: INTERNATIONAL STANDARD ELECTRIC CORP., 15TH FLOOR, 50 CHURCH STREET, N. Y. 7, N. Y. CABLE ADDRESS: MICROPHONE, N. Y.

SIXTY YEARS OF PROGRESS IN THE ELECTRICAL INDUSTRY

Aerial view of remote-controlled hydroelectric plant, believed to be the largest installation of its kind in the U.S.

Safe operation, quick response, reliable service, economy . . . are advantages of large, remote-controlled hydro plant . . . and

Exide®-Manchex® BATTERIES

Believed to be the largest installation of its kind, the 33,750 kw hydroelectric plant, located in northern Wisconsin, actually functions without operators. Normal operation is by carrier current remote control from 25 miles away. Several advantages have been effected by remote control: safe operation, quick response, reliable service, and economy. The supervisory panel includes such instruments as: wattmeter, variometer, 115-kw bus voltmeter, gate-position indicator, headwater level indicator, and a kilowatt-hour accumulator, together with the necessary select and operating push-buttons and lamps to give proper indications of operations and alarms.

Assisting in the remote-control of the hydro plant are Exide-Manchex batteries. They assure:

POSITIVE OPERATION: Dependable performance at ample voltage avoids switchgear operational failures.

INSTANTANEOUS POWER: High rates for switchgear and valve operation with adequate reserve power for all other control circuits and for emergency lighting.

LOW OPERATING COST: Extremely low internal resistance.

LOW MAINTENANCE COSTS: Water required about twice a year. No change of chemical solution during life of battery.

LOW DEPRECIATION: Sturdy, long-life construction.

GREATER CAPACITY in a given amount of space avoids overcrowding.

• • •

Various sizes and types of Exide Batteries are available in plastic containers.

Exide-Manchex is your best battery buy for all control and substation services.

1888 . . . DEPENDABLE BATTERIES FOR 66 YEARS . . . 1954

Installation of Exide-Manchex 60-cell DMC-17 batteries at the hydro plant.

Exide INDUSTRIAL DIVISION, The Electric Storage Battery Company, Philadelphia 2, Pa.

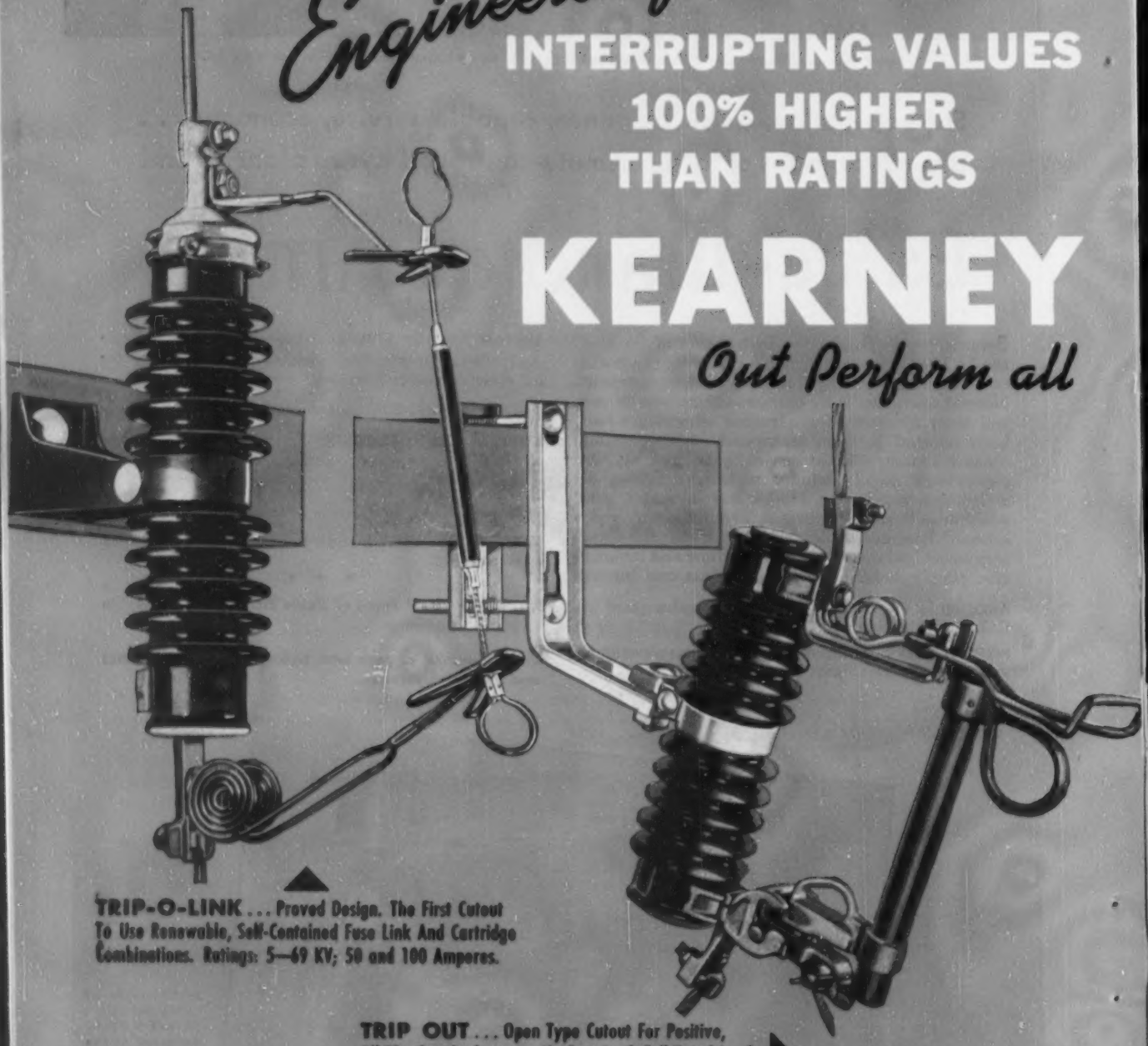
4 Leaders in the Field of PRIMARY PROTECTION

Engineered for

INTERRUPTING VALUES 100% HIGHER THAN RATINGS

KEARNEY

Out Perform all



TRIP-O-LINK . . . Proved Design. The First Cutout To Use Renewable, Self-Contained Fuse Link And Cartridge Combinations. Ratings: 5—69 KV; 50 and 100 Amperes.

TRIP OUT . . . Open Type Cutout For Positive, All-Weather Performance At Sustained, Full-Rated Load. Ratings: 5—69 KV; 100 and 200 Amperes.

Specify **KEARNEY PRODUCTS**

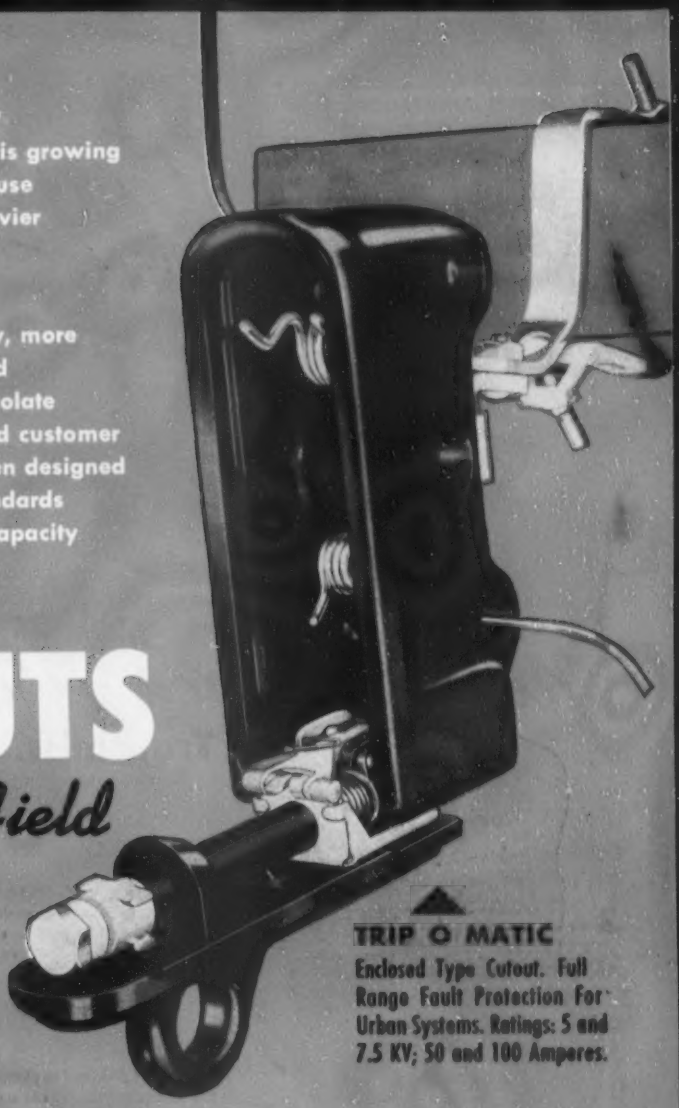
FOR BETTER CONSTRUCTION • SAFER MAINTENANCE

HAVE YOU added substation capacity recently? Chances are you have because load density is growing fast. Then ask yourself this question. Will present fuse cutouts on my distribution system interrupt the heavier fault current? If the nameplates say "KEARNEY" . . . then the answer is "YES."

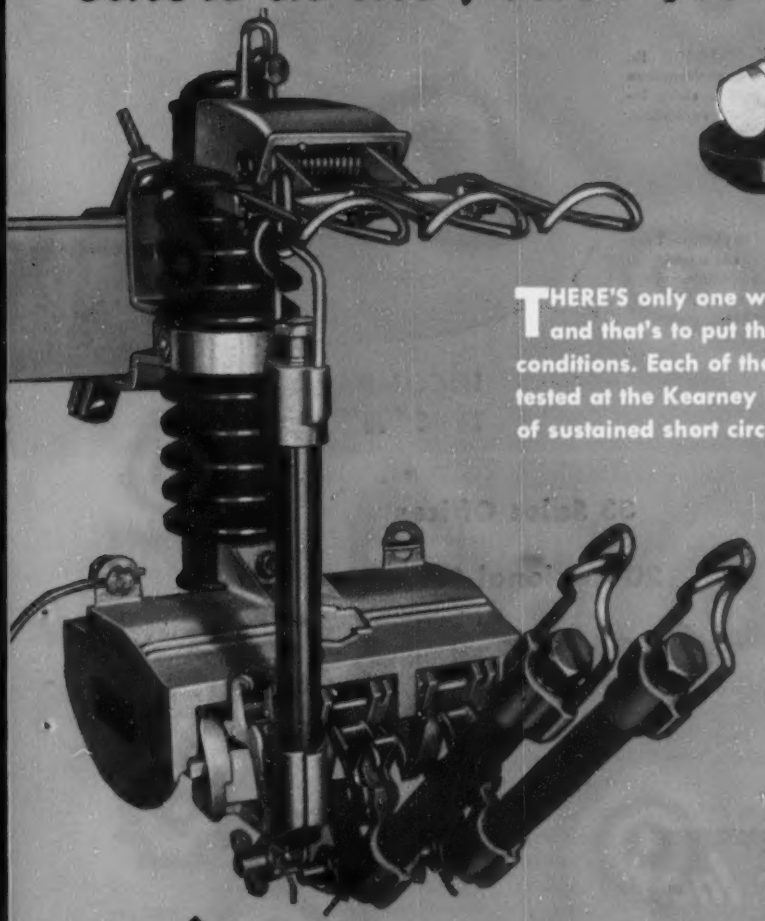
Feeder outages in 5 years will be even more costly, more damaging than they are now. Kearney field-trained engineers know first hand how important it is to isolate faults; how much they can cost in time, money and customer ill will. That's why Kearney Fuse Cutouts have been designed to clear shorts far heavier than present NEMA standards require. And remember . . . this extra interrupting capacity costs you no more than ordinary cutouts designed for present loads only!

fuse CUTOUTS

others in the Power Field



TRIP O MATIC
Enclosed Type Cutout. Full Range Fault Protection For Urban Systems. Ratings: 5 and 7.5 KV; 50 and 100 Amperes.



TRIPSAVER . . . Three Shot Reclosing Type Cutout. Provides Service Continuity On Troublesome Circuits. Ratings: 7.5—34.5 KV; 100 and 200 Amperes.

THERE'S only one way to check up on field performance . . . and that's to put the cutout into service under exact operating conditions. Each of the 4 fuse cutouts illustrated has been thoroughly tested at the Kearney Sub-Station Laboratory, where 445,000 Kva of sustained short circuit energy are available line to line. Each has proved itself to have the extra interrupting capacity needed to clear increased fault currents.

Then, too, operating records from utilities the country over prove that Kearney cutouts give trouble-free performance in every type of climate, in every type of corrosive atmosphere. At least 15 years of on-the-line service stand behind each of these leaders in primary protection. Take advantage of this proved record.

Be ready for tomorrow... Specify Kearney Today!

JAMES R. KEARNEY CORPORATION
4224-42 CLAYTON AVE. • SAINT LOUIS 10, MO.
Canadian Plant: Guelph, Ontario

For You

PORCELAIN PRODUCTS
HIGH VOLTAGE DIVISION PLANT
PARKERSBURG, WEST VIRGINIA

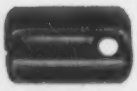
Porcelain Products
New Improved Production Facilities
Transmission and Distribution Insulators and Fittings

No. 66200-6"-10,000 lb. M & E—dated, performance tested distribution strain insulators. Quality controlled.

No. 6198N distribution pintype. Type "N" glaze eliminates radio and television interference developing at the insulator—available on all pintypes, new large wire grooves.

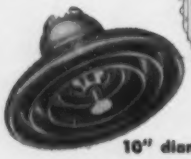
A RUGGED Work-horse ON *DEAD-ENDS*

Transmission and distribution fittings.



Guy Strain Insulators

Wet Process Spools



10" diameter suspension insulators.

INCOMPARABLE *TYPE "N" GLAZE*

PP INC.
Porcelain Products, Inc.
PARKERSBURG, W. VA.

FEWER SPLICES need be made when you run "all purpose" Durasheath. It can be run buried, overhead, in ducts . . . in one continuous run.

New trend in industrial wiring: Neoprene jacketed cable

Users find this tough, long-lasting "premium" cable actually costs little more to use . . . then cuts upkeep.

A chemical plant in Texas uses ANACONDA Durasheath* neoprene jacketed cable for power and lighting. A plant in St. Louis does, too. Another in Chicago.

The practice of using versatile Durasheath for power cable has caught on from coast to coast. And there's good reason.

This cable costs little more to use than the cheapest cable you can buy—and more than makes up this difference in long trouble-free service, lower maintenance costs!

Durasheath's tough jacket is made of specially compounded neoprene. It shrugs off heat, moisture, corrosive fumes. And it takes rough handling in stride. As demand for power rises, Durasheath provides added reliability.

Industry engineers call Durasheath "good insurance." And it is!

Durasheath comes in all sizes, single and multiple conductor, copper and aluminum from 600 to 15,000 volts. You can run it in the ground, overhead, in damp ducts in *one continuous run* with minimum splicing. Want more information? See your Anaconda Representative or write *Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.* *Reg. U. S. Pat. Off. 54567A

Durasheath neoprene jacketed cable

ANACONDA®

Crepe paper applied on one leg of 27 K.V. — 3 conductor — 500 M.C.M. paper insulated, gas filled cable.

Oil-immersed Varnished Cambric applied on 27 K.V. — 3 conductor — 500 M.C.M. paper and lead solid type cable.

Select your insulating tapes from the complete Irvington line

For gas-filled cable, use Irvington vacuum treated, oil impregnated Crepe Paper No. 4000 — packaged in cans to meet your specific requirements for number and size of rolls. *Whenever* your needs for crepe paper are not fully met by packaged splicing kits, make Irvington your source of supply.

For oil-filled cable, use No. 5000 Yellow or No. 5500 Black Low Loss Varnished Cloth Tape — both packaged under vacuum. Or if you prefer, choose No. 6000 Yellow or No. 6500 Black Oil Immersed Varnished Cloth Tape.

OTHER IRVINGTON PRODUCTS FOR UTILITIES: *For moisture-proof, oil-tight cable splices and stop joints* on rubber, paper or cambric insulated cable, use No. 621 Harvel Oil Stop. *And for an oilproofing finishing coat* over bus bar wrappings — or for sealing pipeline joints and gaskets — apply No. 32 Red Enamel.

Look to
IRVINGTON
for Insulation Leadership
INSULATING VARNISHES
VARNISHED CAMBRIC
VARNISHED PAPER
VARNISHED FIBERGLAS
INSULATING TUBING
CLASS "H" INSULATION

Write for technical data sheets and samples.

IRVINGTON VARNISH & INSULATOR

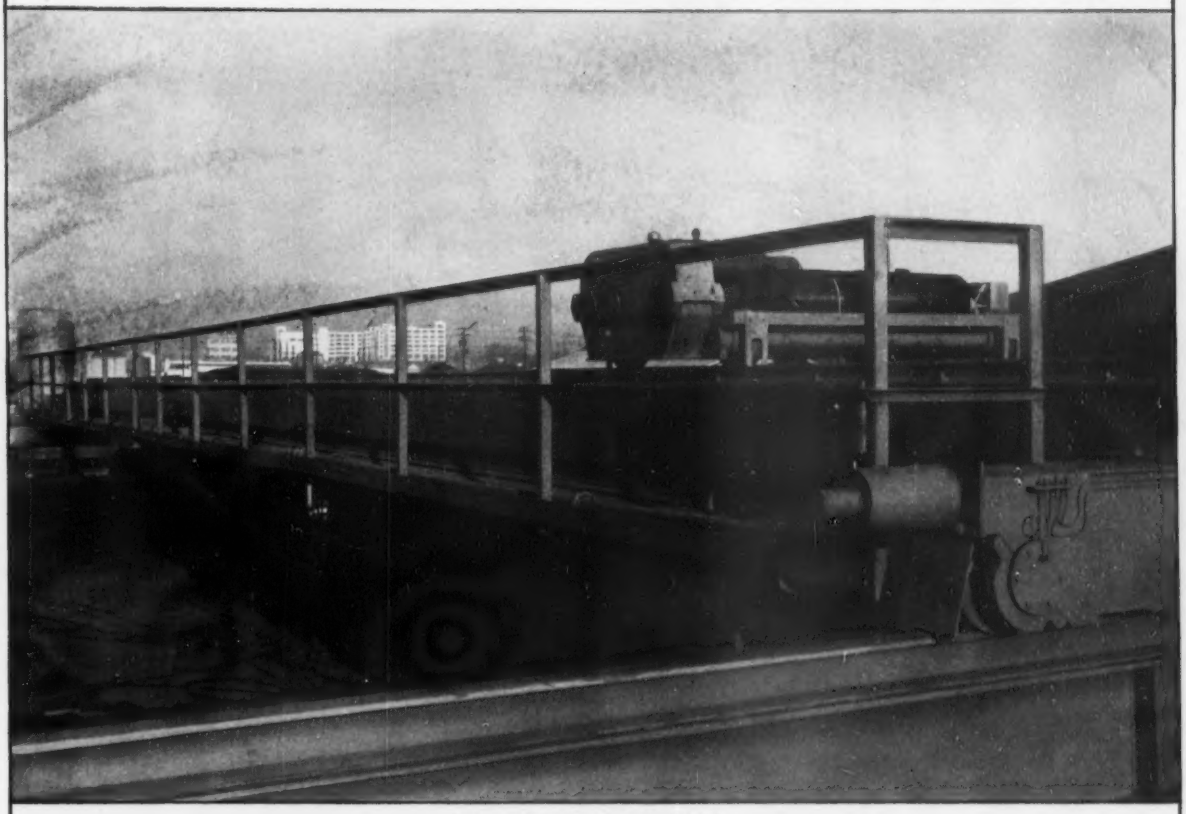
DIVISION OF MINNESOTA MINING & MANUFACTURING COMPANY

21 ARGYLE TERRACE, IRVINGTON 11, N. J. • PLANTS: IRVINGTON, N. J.; MONROVIA, CALIF.; HAMILTON, ONTARIO, CANADA

5 TON BRIDGE CRANES

built by PACECO

"TAILORS OF STEEL"®



Portsmouth Project, Portsmouth, Ohio

Twenty of these 5 ton cranes were sold competitively in Ohio on a delivered price basis. All parts of the crane were built, assembled and tested at Paceco's plant prior to shipment.

Large crane features were incorporated on these 89′ span bridge cranes. Hoist drive gearing, bridge drives and trolley drives run in rugged, all-welded, oil-tight cases; all open gears are eliminated.

All-welded trolley with built-in Paceco Load Brake Reducer is stress relieved and machined after fabrication, insuring accurate, permanent alignment of all trolley machinery.

Bridge girders are all-welded box type construction. Bridge trucks are line bored in pairs to insure accurate wheel and bearing alignment.

Paceco invites your inquiries when your needs fall within our scope of service, including cranes, gates, hoists, penstocks, pipe, valves and other units requiring skilled fabrication of metal plate and precision machine work.

One job . . . one responsibility.

PACIFIC COAST ENGINEERING COMPANY

Alameda, California

ENGINEERS • MACHINISTS • FABRICATORS

Instruments to • MEASURE • RECORD • CONTROL Light

WESTON ILLUMINATION METERS

Model 703 Sightmeter or Foot-Candle Meter

For quick measurements in homes, factories, etc. Calibrated in seeing tasks (Sightmeter) and directly in foot-candles. Available with or without VISCOR® and cosine correction filters.

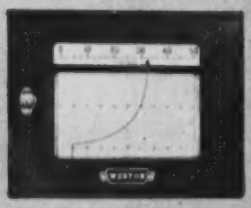
Model 614 Foot-Candle Meter

For commercial lighting surveys. Hinge mounted PHOTRONIC® Cell can be tilted to facilitate use. Measures all types of commercial lighting directly. Wide range of light values.

Model 756 Illumination Meter

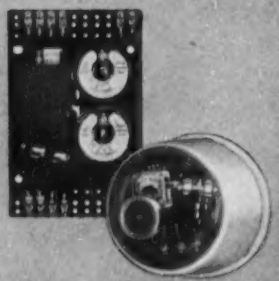
For measurements requiring a high degree of accuracy over broad ranges. Ideal for research and checking other instruments. Corrected for color and Lambert's Cosine Law.

WESTON LIGHT RECORDER



Fluctuations in illumination are accurately charted by the Model 6701 WESTON Light Recorder. PHOTRONIC® photo-electric cell sensing element can be placed wherever convenient. Recorders available with ranges from 20 ft. candles up to as high as 15,000 ft. candles. Ideal for load anticipation studies, determining light output of flares, daylight measurements, and many other industrial applications.

WESTON LIGHT CONTROLS



The Model 1089 plug-in type is the simplest control unit for automatically turning lights "on" and "off" at pre-set levels. Employs no vacuum tubes, resistors or capacitors. Controls either one or two circuits of 3000 watts each at 120 volts a-c. In standard weatherproof watt-hour meter case. The Model 709 (CAA approved) permits quick adjustment of "on" and "off" light values independently, in the field.

For complete information on these WESTON instruments write . . .
WESTON Electrical Instrument Corporation
614 Frelinghuysen Avenue, Newark 5, New Jersey.

WESTON *Instruments*

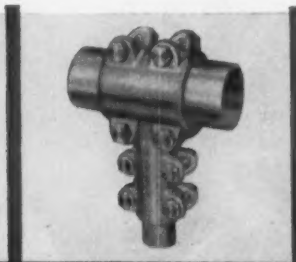
ANDERSON *dependability helped save Timmy's life...*

Every light that burns . . . every life-saving machine that operates in a hospital receives its electrical energy through hundreds of connections, from power plant to sub-station, and from transmission lines to a tiny switch. In steadily increasing numbers, more and more of these connectors, clamps, fittings and accessories bear the ANDERSON BRASS trademark. Power men all over the country recognize ANDERSON'S DEPENDABILITY.

ABW design means quality plus strength in the right places . . . and the ANDERSON line provides utilities, industries and commercial users of electrical power with the most complete source of connections from any one manufacturer. As a matter of fact, ANDERSON is the only manufacturer who can supply *all the terminal connections required* from generator to user.

Specify ANDERSON for extra dependability and long service life!

TYPE DSH . . .
STUD CONNECTOR
For bar, tubing or cable connections — straight up or 90° to stud



TYPE AITT . . .
ALUMINUM "T" CONNECTOR
For Aluminum IPS tubing main and tap. Aluminum to copper combinations also available.

TYPE UP . . . BUS SUPPORT
For copper tubing mounted on pin and cap type insulators. Also copper cable, aluminum cable and aluminum tube fittings available.

ANDERSON
BRASS WORKS, INC
BIRMINGHAM
ALABAMA

FOR MORE COMPLETE INFORMATION consult your nearest ABW representative or contact our home office.

PHELPS DODGE OFFERS COMPLETE CONDENSER TUBE SERVICE

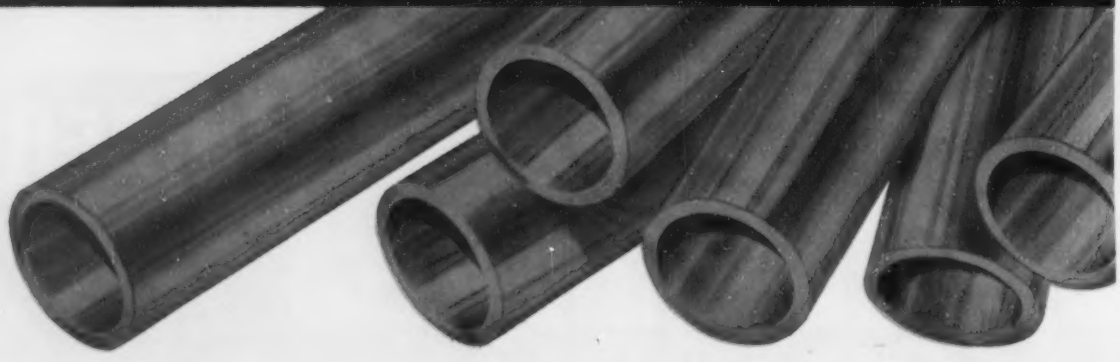
to Meet Increasing Needs of Electrical Utilities!

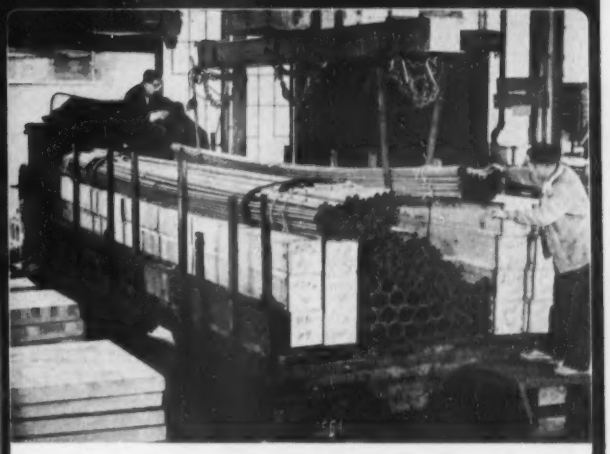
EVERY POWERHOUSE NEED

In all types and alloys including Bi-Metals, Plain and Inhibited Admiralty, Aluminum Brass, Red Brass, Aluminum Bronze, Cupro-Nickels.

ON-THE-SPOT ANALYSIS

by qualified engineers with a special background of experience in solving tube acid and corrosion problems.





CONTROLLED QUALITY

through every step of manufacture—assured by finest laboratory facilities and Phelps Dodge Hot-Forged Extrusion process.

IMMEDIATE DELIVERY

to all areas of the country from modern, strategically located Phelps Dodge mills in Los Angeles, Calif., and Bayway, N. J.

PHELPS DODGE COPPER PRODUCTS CORPORATION

40 WALL STREET, NEW YORK 5, N. Y.

NEW UTILITY STATIONS C-E EQUIPPED

Includes stations placed in operation since the war (in white) and those under construction or being engineered.

NEW BARRY STEAM PLANT

goes into service

The new Barry Steam Plant of the Alabama Power Company joined the system earlier this year when the first of two 125,000 kilowatt units was placed in service. The second unit "went on the line" on July 10th. The plant is designed for ultimate expansion to one million kilowatts.

Located on the historic Mobile River, twenty miles north of the city of Mobile, the first section of this new station makes a substantial 250,000 kilowatt addition to the Company's generating capacity. The Alabama Power Company now has 890,000 kilowatts of steam-generated capacity and nearly a half million kilowatts of hydro.

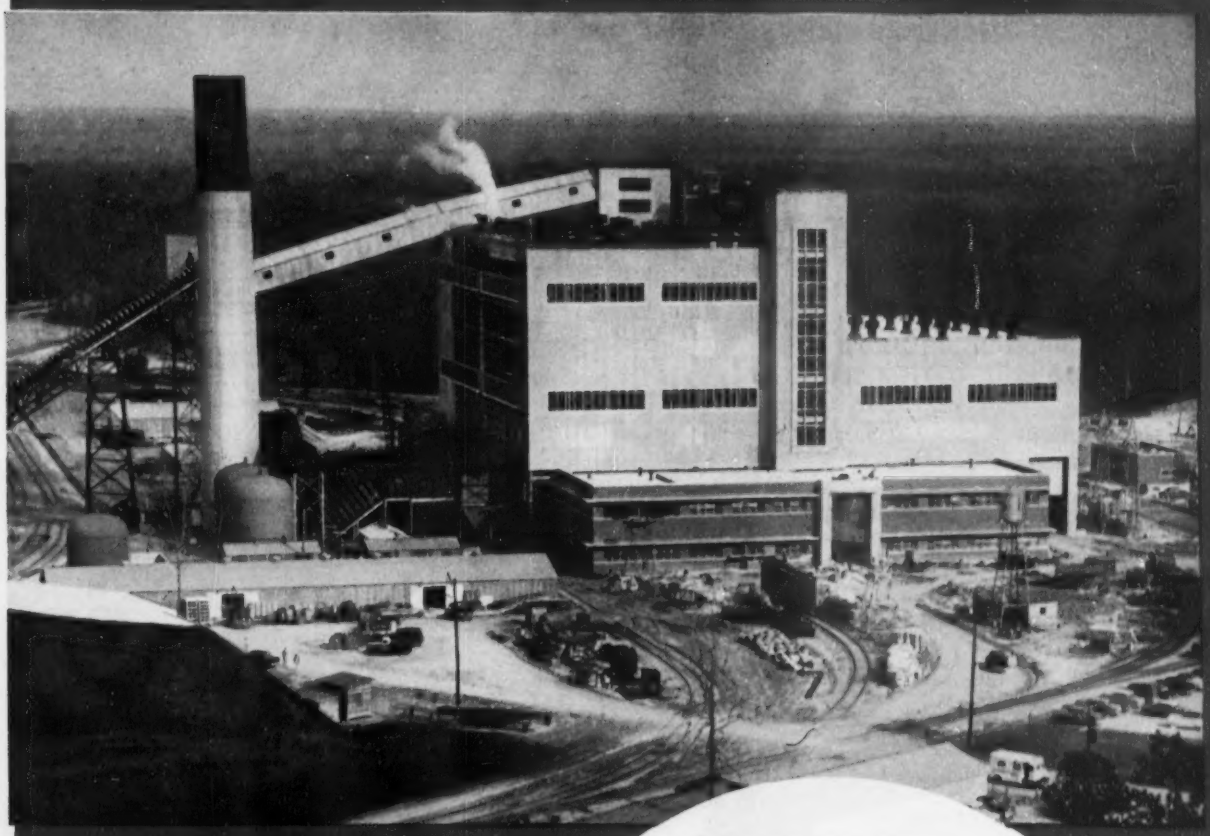
Both of the turbine generators now operating at the Barry Plant are served by C-E Steam Generating Units. A cross-sectional elevation and brief description of one of the two duplicate boiler units appear on the opposite page.

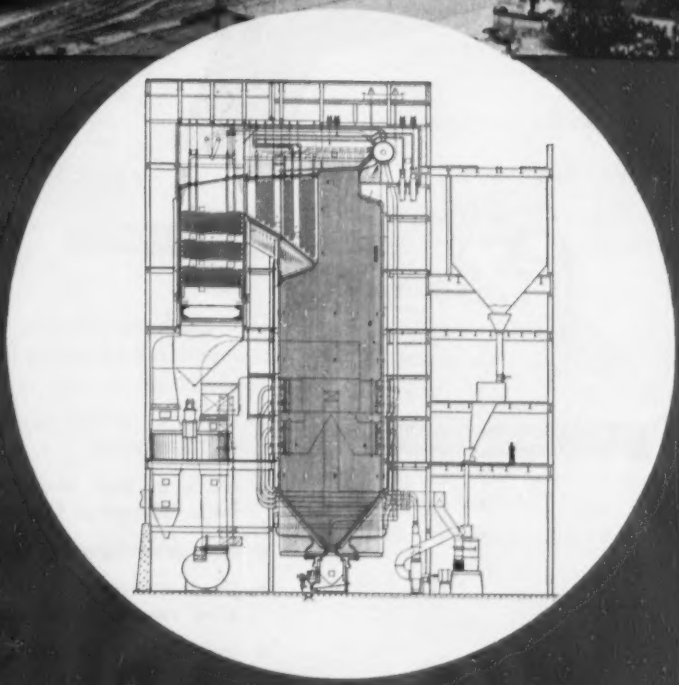
B-771

COMBUSTION ENGINEERING

C-E

Combustion Engineering Building
200 Madison Avenue, New York 16, N. Y.



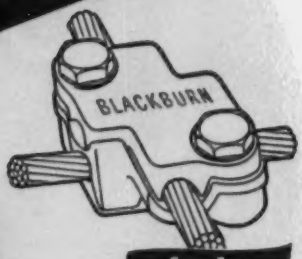


Shown at the right is a cross-sectional view of one of the two duplicate C-E Units now in service at the Barry Steam Plant. They are radiant-reheat boilers with a reheater section located between the primary and secondary superheater surfaces. Economizer surface is located below the rear superheater sections and regenerative air heaters follow the economizer surface. Pulverized coal firing is used employing bowl mills and tilting, tangential burners. Steam is supplied at 1875 psi at 1000 F, reheated to 1000 F.

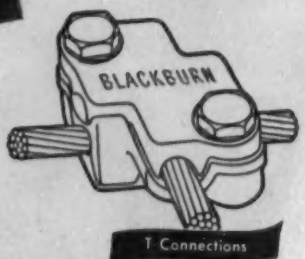
BOILERS, FUEL BURNING & RELATED EQUIPMENT, PULVERIZERS, AIR SEPARATORS & PLANT PIPING SYSTEMS, PACKAGED POWER, AUTOMATIC WATER HEATERS, SOIL PIPE

You can handle a wide variety of jobs with this

Stronger, More Versatile BLACKBURN *Cross Tap* CLAMP



Cross Taps



T Connections

Parallel Connections

End to End Connections

Get quick service for a large number of different connection and wiring jobs with BLACKBURN'S Cross Tap Clamp.

- **Eight connectors accommodate cable sizes from #6 to 1000 MCM.**
- **Made of high strength copper alloy; silicon bronze bolts; phosphor bronze shakeproof lockwashers.**
- **Rounded edges for easy taping.**
- **Greater wrench rotation with either end or socket type speeds installation.**
- **Available from Electrical Distributors everywhere.**

Also available completely tin plated for general purpose work.

JASPER BLACKBURN CORPORATION

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WHY IT WILL PAY YOU TO USE BELL SYSTEM COMMUNICATIONS SERVICES

You save money

With Bell System services, you get efficient and dependable communications at low cost. You are relieved of maintenance, depreciation and other costs of privately owned communications.

You get the service you need

It's flexible and complete. We furnish communications tailored to your exact needs. No more, no less. A change in number or type of circuits can be made any time to keep your communications in step with changing needs.

You get the best service

The Bell System is constantly developing new equipment, methods and techniques to improve your service and keep your communications from becoming obsolete.

You have more investment money available

Your capital is *not* tied up in communications equipment but is available for investment in income-producing power equipment and services.

You concentrate on your own business

Our business is entirely communications, and that's one reason the Bell System offers power companies the finest services today. A communications study by specialists, made without charge, frequently indicates how a power company can improve its communications and realize increased benefits and economies. Talk this over with the Bell Telephone representative near you.

PRIVATE-LINE TELEPHONE

TELETYPEWRITER

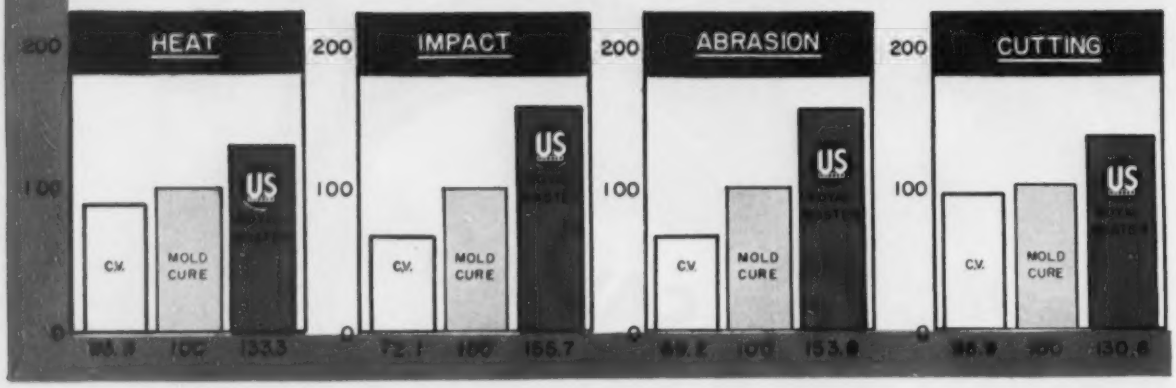
MOBILE TELEPHONE

METERING CHANNELS

BELL TELEPHONE SYSTEM

STARTLING

Comparative performance of portable cords related to major life factors.



New U. S. ROYAL MASTER portable cord

PROVES SUPERIOR TO ALL OTHERS IN EVERY SERVICE FACTOR!

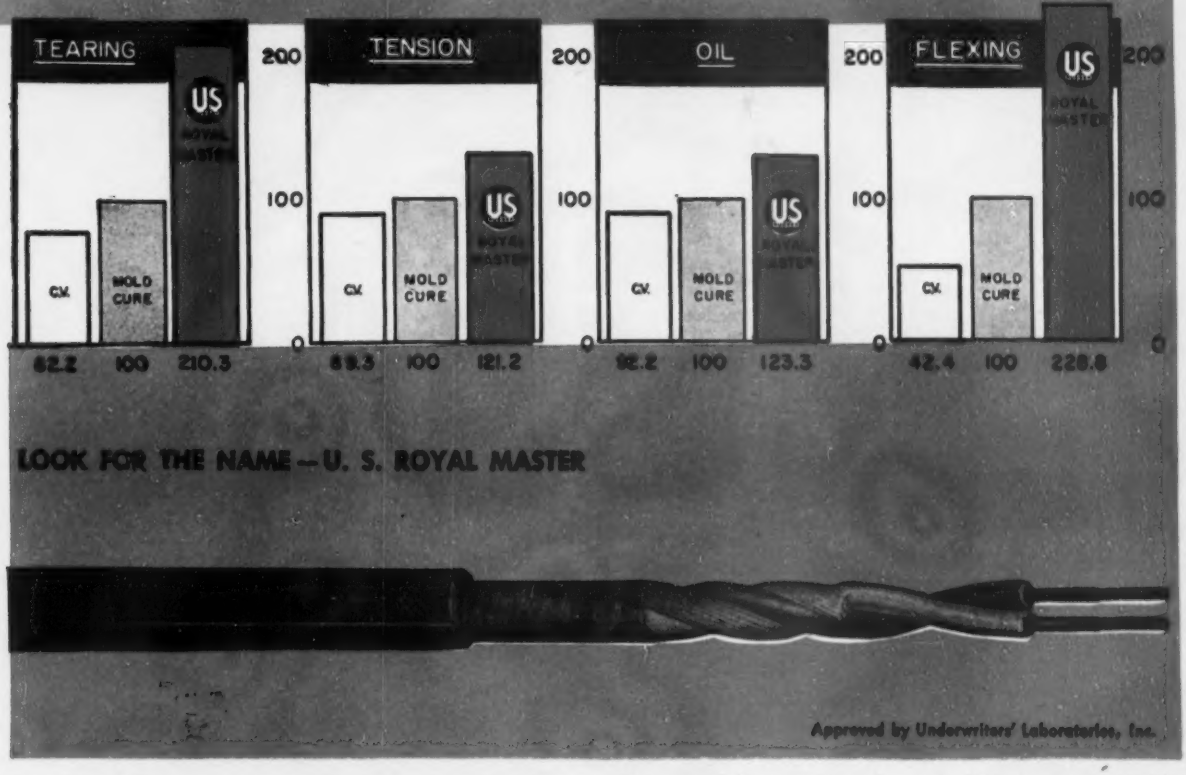
Newly developed U. S. Royal Master Cord gives almost twice the service of other molded cords — gives $1.88 value for every cord $1.00!

Life factor charts illustrate outstanding superiority of new U. S. Royal Master over the average of both the molded cords and the short-lived continuous vulcanized cords of other makes.

US RUBBER

UNITED STATES
ELECTRICAL WIRE & CABLE DEPARTMENT

EVIDENCE!



Cord construction completely reexamined. Over two years ago, U. S. Rubber engineers began a thorough reexamination of electrical cord design and construction. More than a thousand cords, including those of all major competitors as well as our own U. S. Royal Cord, were thoroughly and painstakingly analyzed. Over 10,000 tests were made to determine the principal causes of cord failure.

Every possible life factor was carefully and honestly appraised to find its relation to overall cord service.

With the findings at hand, "U. S." Engineers then drew upon their 64 years of experience in the manufacture of fine quality wire and cable to produce this exceptional new cord.

Every fault uncovered by the exhaustive two-year testing was tackled and solved.

Tested and proved. The new U. S. Royal Master was then tested against all competitive cords—installed in outside plants for final on-the-job corroboration.

U. S. Royal Master Cord proved itself to be unquestionably the finest cord you can buy! So superior, it gives almost double the service life of the average of competitive molded cords—actually gives you $1.88 in value for every cord dollar!

Prove for yourself the phenomenal superiority of U. S. Royal Master. Write to address below for FREE descriptive booklet illustrating the superiority of the U. S. Royal Master Cord. And get in touch with your "U. S." distributor today!

RUBBER COMPANY
ROCKEFELLER CENTER, NEW YORK 20, N. Y.

Generating capacity of this plant is now 260,000 kw. Output goes into transmission system at 115 kv or 230 kv.

How New Upper Midwest Power Plant Assures Uninterrupted Power for Station Auxiliaries

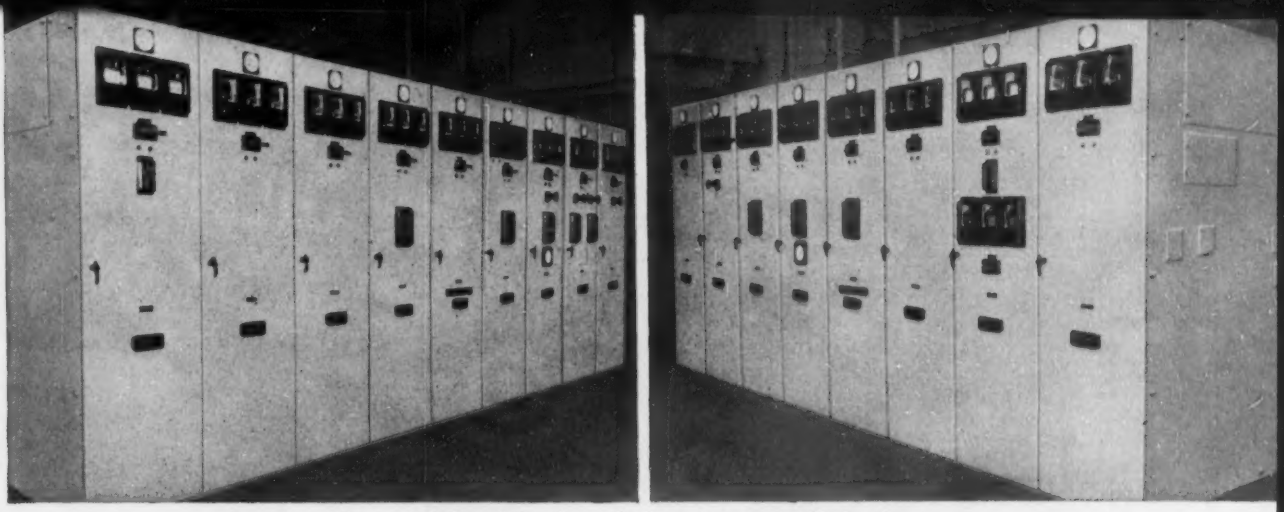
Installation Features Unit Auxiliary Buses in Two Sections With Automatic Emergency Transfer

Pioneer Service and Engineering Company in designing this plant decided on a manual make-before-break scheme on the throwover between the two sections of Allis-Chalmers switchgear. In this way they are sure the secondary source is cut in before cutting power from the primary source. A break-before-make automatic transfer is used in an emergency.

There is a house generator on the first unit only. It operates off the same shaft as the main generator, thus simplifying phasing problems. Operator is forced to use synchronizing switches, however, as a safety feature.

Auxiliary motors are protected by circuit breakers. To keep plant operating continuously, no overload

Progress In Switchgear **ALLIS-**



These two switchgear lineups face each other and are connected by bus shown at top. This group is one of three groups of Allis-Chalmers switchgear at this station.

tripping is used. An overload relay provides alarm on pulverizers and induced draft fan motors. Breakers trip only if there is a fault.

Two Switchgear Lineups

Two groups of Allis-Chalmers switchgear for each generating unit are provided along with duplicate auxiliaries. Each of these auxiliaries has excess capacity, so if one is shut down, the generating unit can still operate at two-thirds of full capacity.

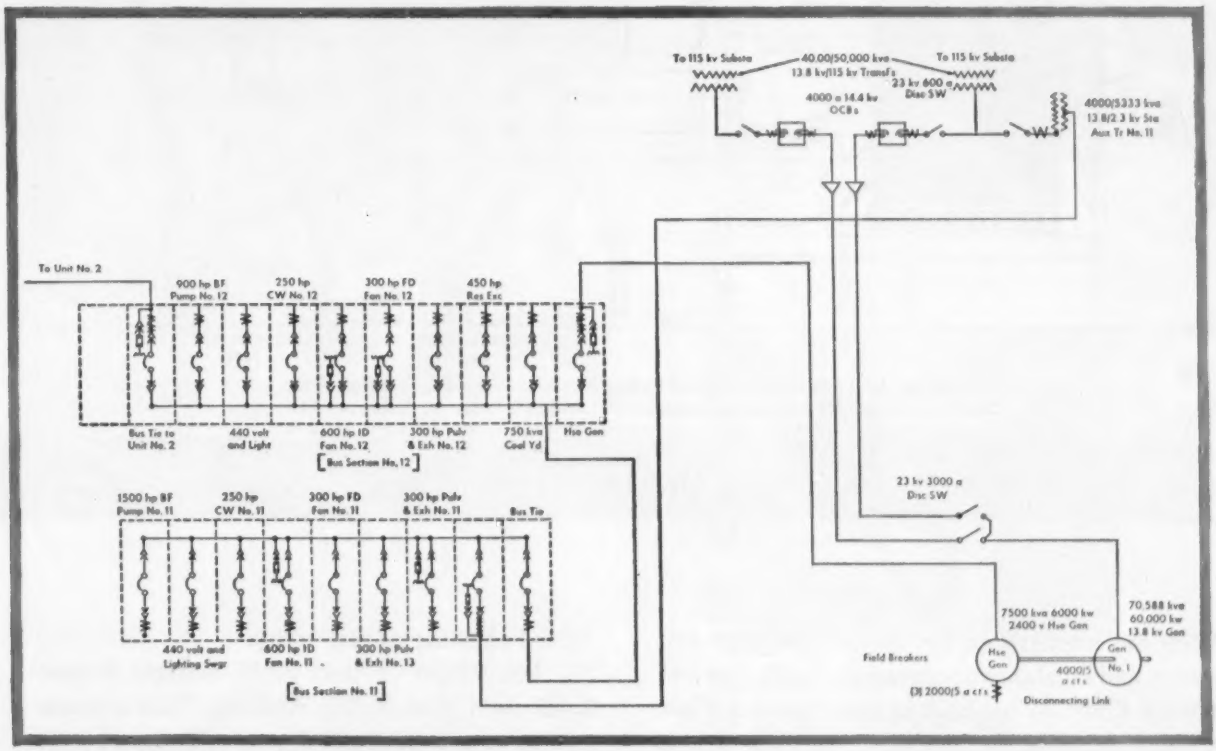
Both pulverized coal and natural gas can be used. These can be burned simultaneously in any desired proportion. This control is manual. Customary sequential interlocks in the switchgear are made with boiler control motors.

Both overload and short-circuit protection are provided by breakers on coal yard and miscellaneous circuits.

★ ★ ★

Allis-Chalmers engineers worked in close cooperation with Pioneer Service and Engineering Company and power company engineers on this interesting project. This is one of many auxiliary switchgear lineups built by Allis-Chalmers. For information, call your nearby A-C office or write Allis-Chalmers, Milwaukee 1, Wisconsin.

A-4449


To 115 kv Substa
40,00/50,000 kva 13.8 kv/115 kv Transf's
To 115 kv Substa
23 kv 600 a Disc SW
4000 a 14.4 kv OCB's
4000/5333 kva 13.8/2.3 kv Sta Aux Tr No. 11
To Unit No. 2
900 hp BF Pump No. 12
250 hp CW No. 12
300 hp FD Fan No. 12
450 hp Res Exc
Bus Tie to Unit No. 2
440 volt and Light
600 hp ID Fan No. 12
300 hp Pulv & Exh No. 12
750 kva Coal Yd
Hse Gen
[Bus Section No. 12]
1500 hp BF Pump No. 11
250 hp CW No. 11
300 hp FD Fan No. 11
300 hp Pulv & Exh No. 11
Bus Tie
440 volt and Lighting Swgr
600 hp ID Fan No. 11
300 hp Pulv & Exh No. 13
[Bus Section No. 11]
23 kv 3000 a Disc SW
7500 kva 6000 kw 2400 v Hse Gen
70,588 kva 60,000 kw 13.8 kv Gen
Field Breakers
Hse Gen
Gen No. 1
4000/5 a c t s
(3) 2000/5 a c t s
Disconnecting Link

Engineered by Pioneer Service and Engineering Company.

CHALMERS

A-C ALLIS-CHALMERS

4 B&W BOILERS AT P·G·and E·'s

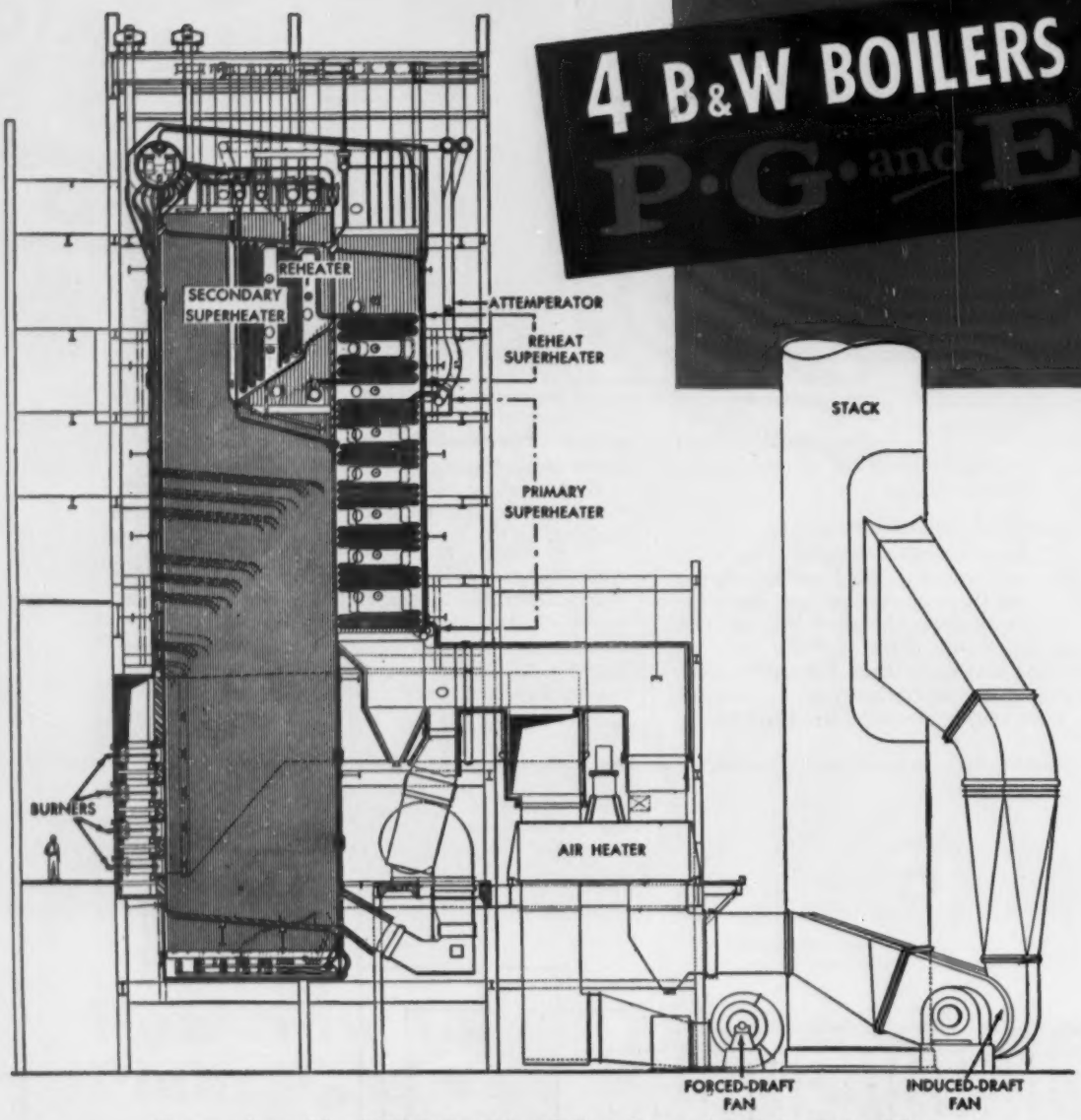
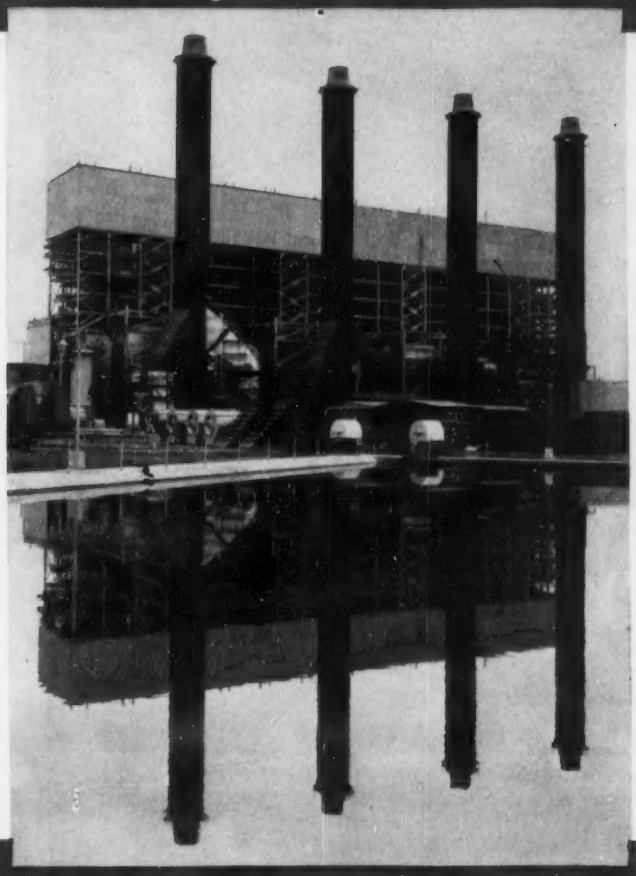


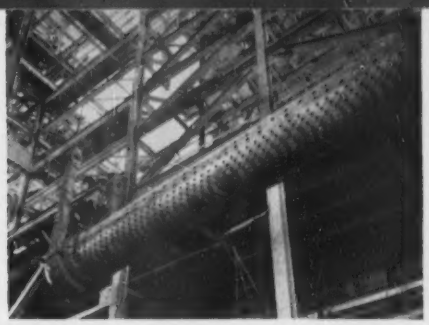
Diagram of one of four B&W Radiant Reheat Boilers with natural circulation. Designed for outdoor installation, each unit has a steam capacity of 1,080,000 lb per hr. Design pressure is 2050 psi and steam at 1850 psi will be superheated to 1000 F, with reheat to 1000 F.

With the emphasis on low initial cost, high efficiency, and reliability of operation, Pacific Gas and Electric Company has built its new Pittsburg Plant to keep ahead of the increasing demands of this heavily industrialized California area. With a generating capacity of 600,000 kw, it is the largest steam-electric generating station yet built west of the Mississippi River and is indicative of the far-sighted planning of this utility.

The installation of four B&W Radiant Reheat Boilers will give the big Pittsburg Plant a steam capacity of over 4,000,000 lb per hr. Designed with B&W Cyclone Steam Separators for natural circulation, each unit is equipped to burn oil and natural gas with provision for later conversion to coal if this becomes desirable.

new Pittsburg Plant help generate 600,000 more kilowatts





One of the huge steam drums being jockeyed into place. Each drum weighs more than 150 tons and is 56 feet long.

P. G. and E.'s new modern Pittsburg Plant is the largest steam-electric generating station in the West. Everything except the control room, firing aisles and ends of turbines is outdoors. Bechtel Corp., engineers.

Front of boiler furnace wall under construction. Openings are for the 16 burners with which each unit is equipped.

This outstanding station represents a combination of new engineering trends and sound design practices. The B&W steam generators at the Pittsburg Plant are among the most modern of their type; one more example of the unending cooperative efforts of power company and B&W engineers working together for almost a century to attain ever-higher peaks of efficiency in power generation.

BABCOCK & WILCOX

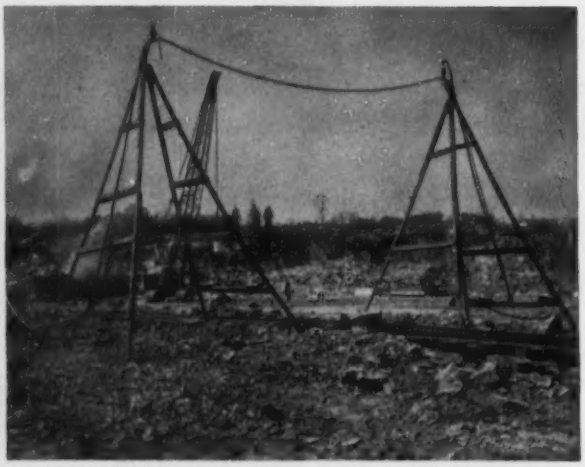
BOILER DIVISION

G-685

"Our *Tiger Brand*

NOTICE THE CABLE TRAY fastened to the shovel. This was developed by Universal Atlas for easier cable handling.

TWO WORKMAN WATCH from blast shelter as charge is set off in distance. Low horses cushion cable from shock of falling rock.



HERE A CABLE is raised on horses to clear the railroad track. It feeds the shovel visible in background.

Amerclad lasted 12 years"

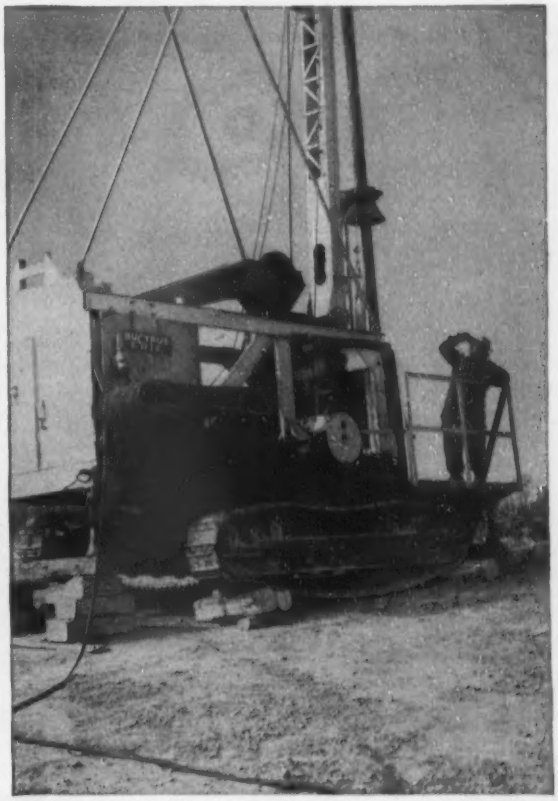
Says Chief Electrician, Hudson Plant
Universal Atlas Cement Company

Year after year, at this quarry, the Amerclad is exposed to knife-sharp fragments of flying rock. During the summer, the rock often gets so hot that you can't even touch it. Other times, the cable lies out in the rain and snow—often at sub-zero temperatures.

At the Hudson, N. Y. quarry of Universal Atlas, Chief Electrician Frank Rodmond said, "This Amerclad runs the constant danger of being hit with flying rock fragments through secondary blasting. Yet the down-time cost of this operation is so high that we just can't stand cables that keep failing. We kept that last batch of Amerclad 12 years before we replaced it, yet it was still serviceable when we switched over to new Amerclad."

If you want service like this, specify Amerclad the next time you need cable that can really take it. Amerclad is available in a great many sizes and constructions, with or without shielding. There is a type to power anything from a river dredge or mine locomotive down to a rough and tumble electric hand drill. *Send the coupon,* and get more information.

AMERICAN STEEL & WIRE DIVISION
UNITED STATES STEEL CORPORATION
GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA., SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK



THIS IS A TYPICAL DRILL. It uses a 4-conductor No. 8 Amerclad cable.

A STANDARD TIGER BRAND CABLE FOR EVERY SPECIAL JOB!

paper & varnished cambric cable
asbestos wire and cable
aerial, underground & submarine cable
mold cured portable cord
machine tool & building wire
special purpose wire & cable
shovel & dredge cable

SEND THE COUPON

American Steel & Wire Division
Room EE-104, Rockefeller Building
Cleveland 13, Ohio

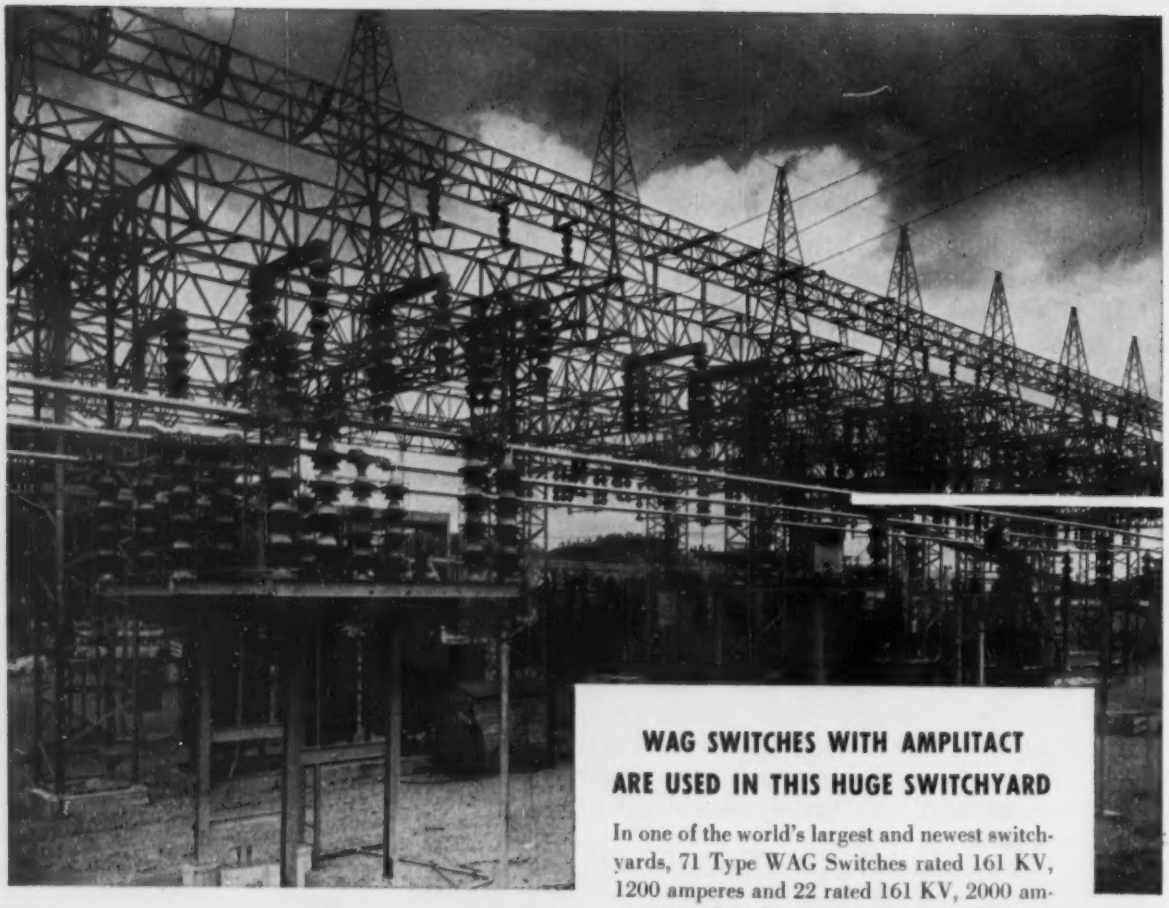
☐ Please give me more information about Amerclad.
☐ I'd like to talk to your representative.

Name .....
Firm .....
Address .....
City ..... State.....

U·S·S Tiger Brand ELECTRICAL WIRE & CABLE

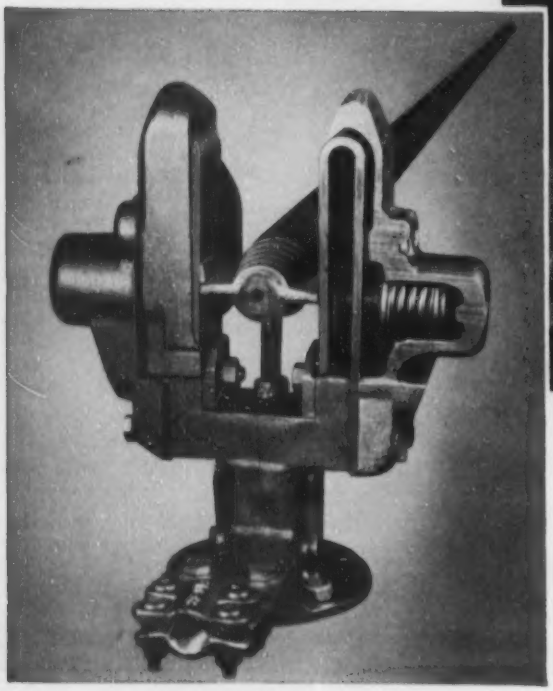
USS

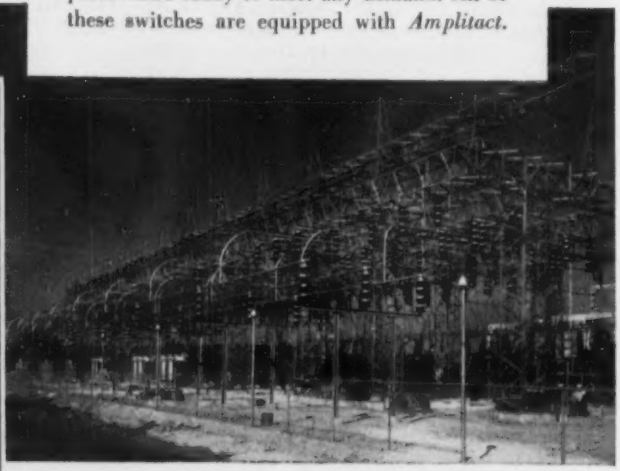
UNITED STATES STEEL



WAG SWITCHES WITH AMPLITACT ARE USED IN THIS HUGE SWITCHYARD

In one of the world's largest and newest switchyards, 71 Type WAG Switches rated 161 KV, 1200 amperes and 22 rated 161 KV, 2000 amperes stand ready to meet any demand. All of these switches are equipped with *Amplitact.*





This cutaway view of the *Amplitact* shows the switch blade in its engaged position. Electromagnetic forces are employed to increase contact pressure under fault currents.

A DEPENDABLE COMBINATION

WHEN SHORT CIRCUIT CAPACITIES EXCEED STANDARD LEVELS

TYPE WAG SWITCH WITH *AMPLITACT*
TRADE MARK

The changing complexion of power systems all over the world, with the trend toward higher and higher short circuit capacities, is imposing more stringent duty requirements on transmission level equipment than ever before.

As there arose in the utility industry the need for a switch that could be safely applied on systems where short circuit capacities exceeded standard levels, Southern States developed and incorporated in its Type WAG Air Break Switch an entirely new contact design . . . the *Amplitact*.

This new contact has proven, in nation-wide installations, to be the answer to extreme system short circuit conditions that are now being accepted as normal by many utilities.

THE AMPLITACT AND HOW IT WORKS

Current passing from a switch blade through conventional contacts tends to relieve contact pressure. The relationship between members is such that magnetic forces, developed by current flow, oppose contact spring forces. Such magnetic forces are not great at rated load or relatively low fault currents, but at higher currents they become considerable and at some value of current they will completely relieve pressure, resulting in contact failure.

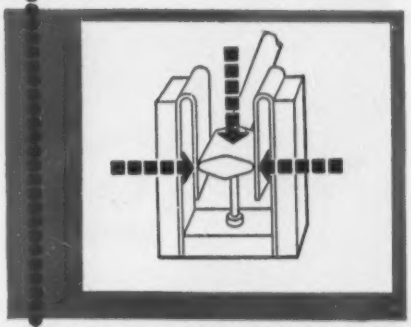
The *Amplitact* puts these negative forces to work in the following manner:

The schematic drawing, lower right, traces current through the *Amplitact*. Inner segments of loops are resilient and outer segments are fixed against rigid abutments.

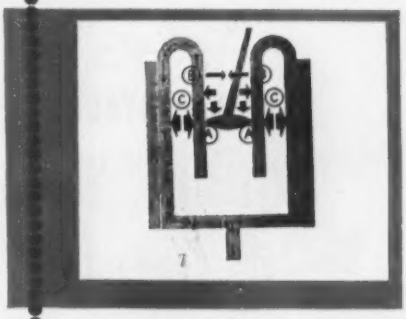
A. Current flowing through the blade changes direction 90° when current interchange is made at junction of blade tip and resilient contact. Resultant forces from these changes in current direction materially assist in holding the blade in the closed position.

B. Two parallel paths are formed for the current in the two resilient segments. Since the current is flowing in the same direction, these conductors tend to attract—thus increasing contact pressure.

C. Two parallel paths are also formed by the fixed and resilient segments. However, in this case the current is flowing in opposite directions in conductors in close proximity. The result is a powerful force from opposing magnetic fields which amplifies contact pressure in proportion to the square of the current flowing through the loops.



The above schematic drawing shows the relative electromagnetic forces resulting from current flow through the reverse loop members of the *Amplitact*. These forces greatly increase contact pressure and positively hold the switch blade in the engaged position.



WHEN AMPLITACT IS SUPPLIED

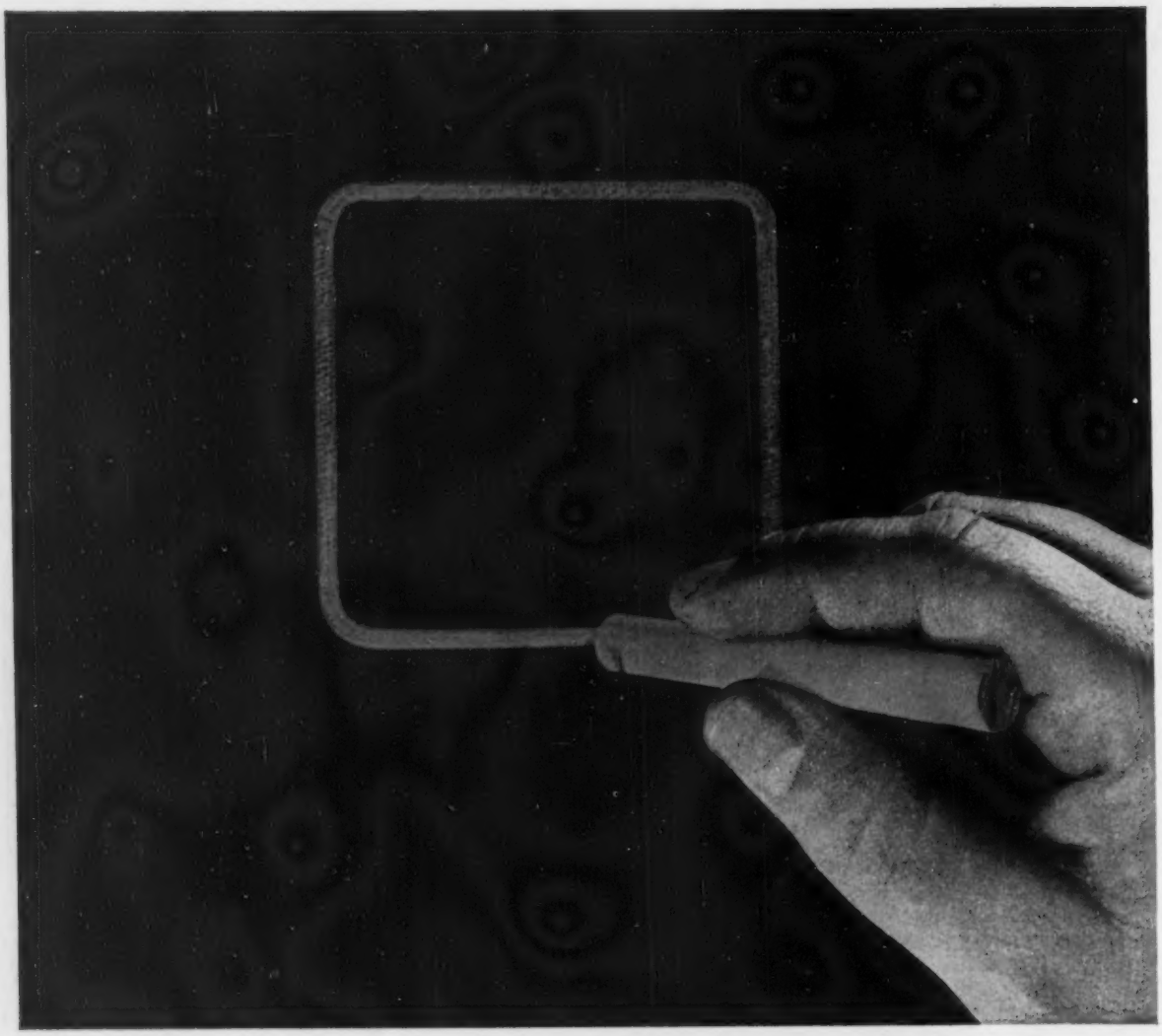
The *Amplitact* is a heavy duty premium contact supplied on all ratings of the Type WAG 1600 amperes and above. It is not supplied on switches rated 400 and 600 amperes. In switches rated 1200 amperes availability varies as follows:

7.5 KV—34.5 KV	Amplitact supplied
46 KV— 161 KV	Standard Contact or Amplitact Optional*
196 KV and above	Standard Contact

*An extra charge is made for the Amplitact when it is specified in the 46 KV—161 KV, 1200 ampere ratings.

SOUTHERN STATES
EQUIPMENT CORP.
HAMPTON, GEORGIA

IN CANADA:
Dominion Cutout Co., Ltd., Toronto



THE ADVANTAGES OF

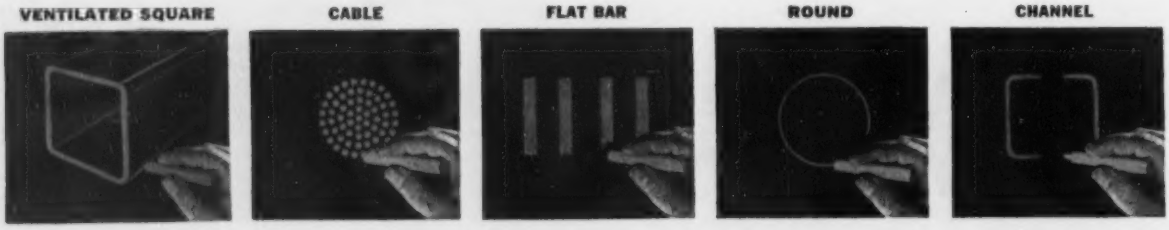
SQUARE TUBE

BUS CONDUCTORS

Joints and connections are easily made on the flat sides of ANACONDA Square Tubular Copper Bus Conductors. Their larger surface per unit of cross section is important in enclosed designs where radiation must dissipate heat. Sometimes these tubes are perforated with rows of holes on opposite sides to cool by circulating air currents. Metal cross sections are greater than in round tubes of same diameter and gage. Capacity is greater in the same space allowance.

There is a complete line of ANACONDA Copper Bus Conductor designs for every type of installation and power requirement. Write today for your copy of "ANACONDA Copper Bus Conductors" containing illustrations and detailed technical information. *The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario.* 88131 Rev.

carry the load with ANACONDA® Bus Conductors



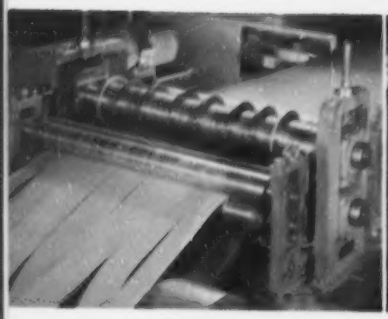
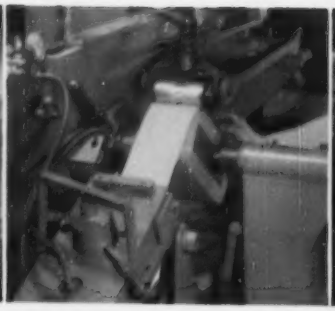
H-307-54

MOLONEY ELECTRIC

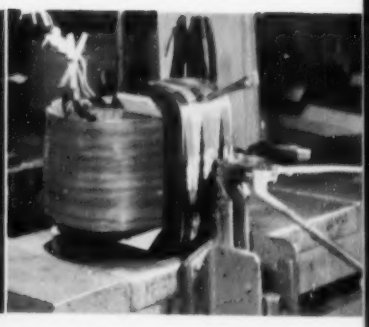
HiperCore

CONVENTIONAL AND CSP DISTRIBUTION TRANSFORMERS

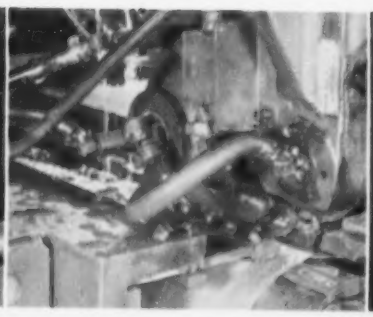
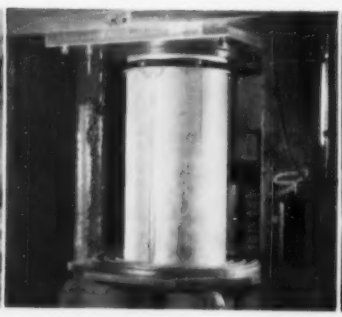
MOLONEY ELECTRIC COMPANY • ST. LOUIS 20, MISSOURI

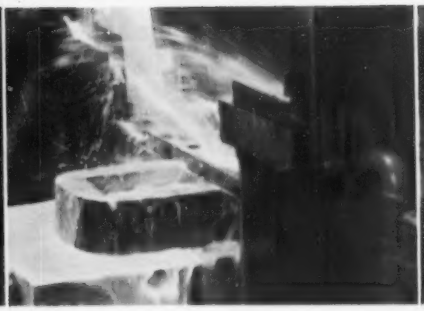
Design and engineering experience,



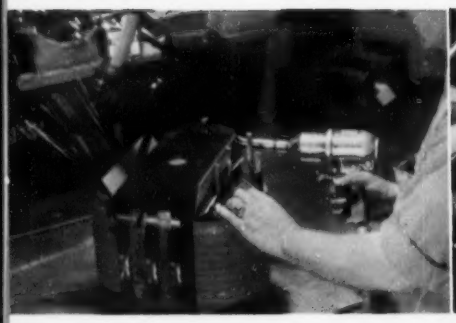
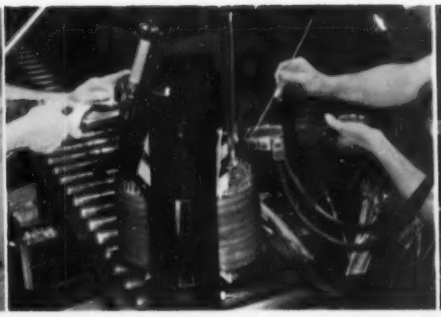
facilities produce these

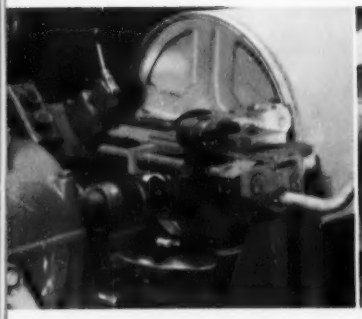
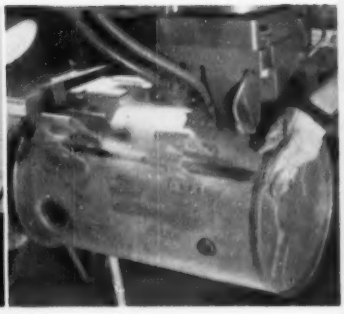
of outstanding quality and .



skilled fabrication and superior

transformers

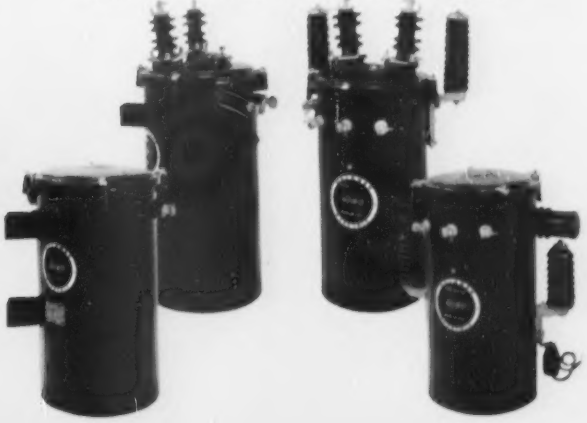
dependability

MOLONEY ELECTRIC

HiperCore

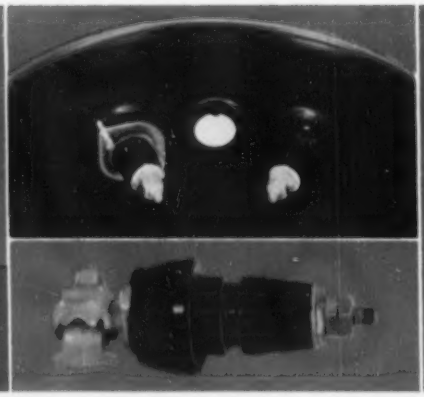
DISTRIBUTION TRANSFORMERS

Available in all Standard Ratings in both
Conventional and CSP types from stock

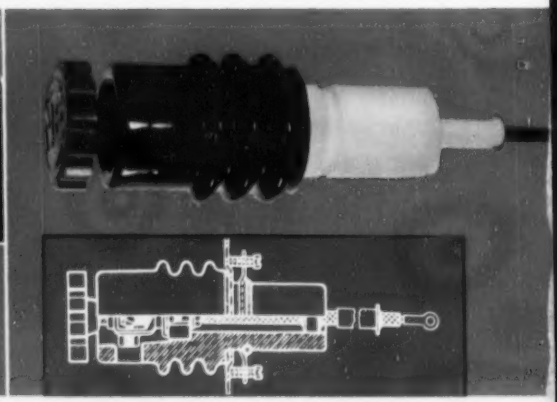


HIPERCORE FEATURES

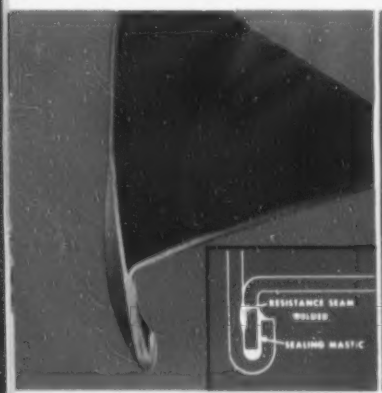
Corprene cover gaskets on Moloney HiperCore Transformers are retained by a ring welded to the tank cover. A perfect seal is obtained. Because the gasket is not cemented it is reuseable, thus eliminating the need to replace cover gaskets each time the transformer is serviced.



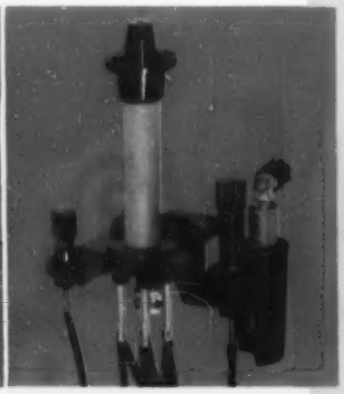
Low voltage bushings keyed to prevent rotation—porcelain keyed to tank and metal stud keyed to porcelain, thus eliminating accidental contact between "hot" wires.



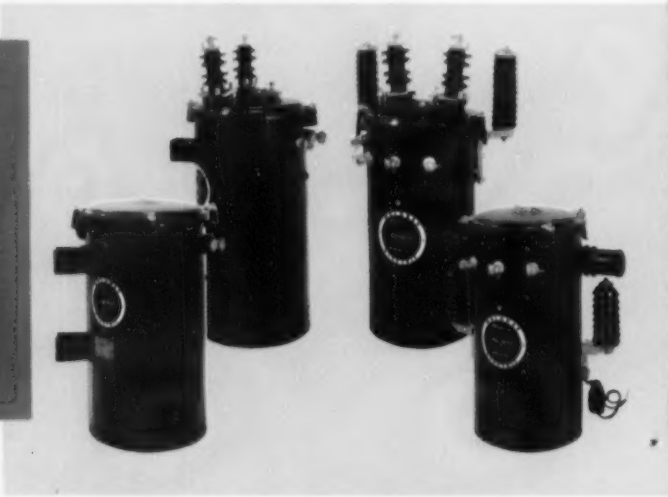
Sidewall mounted high voltage bushings on Moloney HiperCore Transformers are provided with a molded, high-impact resistant phenolic cold rubber protective cap for working "hot". Conductor openings permit connection from either side with solid or stranded copper or aluminum conductors of all standard sizes.



Tank bases on Moloney HiperCore Transformers are protected against damage due to handling and weather. The tank base is bonded to the shell by a continuous seam weld. The inside edge, where water might stand, is coated with a sealing mastic and rolled in, forming a lasting barrier against moisture, air and rust.



Tap changers on Moloney HiperCore Transformers have double moving contacts which snap into position to assure positive contact. Operating handle, easily accessable thru handle-hole in cover with tap position clearly visible, is located above hot oil level.



Moloney HiperCore Transformers are available from stock in all Standard Ratings in both Conventional and CSP designs.

Litho in U. S. A.

MOLONEY ELECTRIC COMPANY

Power Transformers • Distribution Transformers • Step Voltage Regulators • Regulating Transformers • Load Tap Changing Transformers • Load Center Transformers • Unit Substations Network Transformers • Constant Current Transformers • Capacitors • Transformers for Electronics

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA

Jubilee Climax

On this day 75 years ago Thomas Alva Edison lighted the first successful incandescent lamp. On this day—Oct. 18—23 years ago the noted genius died.

During the 52 years from the development of the lamp until his death, the Wizard of Menlo Park saw his brainchild grow into a gigantic industry bringing light to hundreds of communities throughout the nation and the world.

In tribute to Edison's achievement and in recognition of the industry it helped to spawn, the Light's Diamond Jubilee celebration this week moves toward a climax with a two-hour television extravaganza to be presented Sunday evening, Oct. 24, over the largest TV network ever assembled. Outstanding personalities of stage and screen have been gathered to write, stage, and act in this presentation which promises to make entertainment history. The appearance of President Eisenhower on this program serves to emphasize the wide public attention and acclaim which has come to the Jubilee.

The President did much to set the tone of Jubilee year in his message to the Edison Electric Institute convention in June when he said, "This invention and the industry based on it have made immeasurable contributions to this nation's strength. In America's continuing efforts to improve the living standards of its citizens, the light and power industry is an instrument of inestimable value."

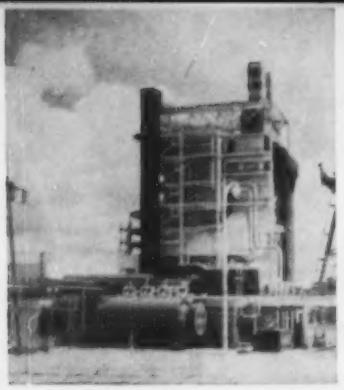
These words of the President have served as a keynote for the Diamond Jubilee celebration which has reached into every village and hamlet throughout the nation. After all, what better way is there to represent the magnitude of Edison's achievement than against the background of the tremendous contributions of the electric power industry to the nation.

Every media of information has been utilized to carry this message of "light" to the public. Nationwide, the story of Edison and the industry he helped to found has been carried in scores of magazine articles, radio and TV broadcasts, and advertising of all types. A film, "Eager Minds," is now making the rounds of civic and educational groups under auspices of the industry.

In many local areas the observance has been marked in numerous educational and entertaining ways. This week electric companies are staging luncheons and dinners in most of the large metropolitan areas to honor Edison's achievement and to hail the progress of the industry. Displays at county fairs and in show windows, features in company publications, tie-ins in advertising have helped round out the red carpet treatment given the celebration throughout the nation.

Credit for originating and coordinating many of these activities on a nationwide scale goes to Light's Diamond Jubilee Committee, but again it has been the individual electric company working at the local level that has supplied some of the gems for the diamond-studded celebration.

At the onset of this celebration we expressed the hope that the industry would speak loudly and often as the leaders of progress in building a nation with electricity (EW, May 31, p 51). To a large extent that hope has been gratified.



Conservatism Rules in Plant Design

Word that some radical departure in power plant design is to be applied naturally makes the news columns. Steam pressures of 6,000 psi, temperatures of 1,200 F, completely outdoor plants—all these have englamored the headlines as they appeared. All set the pattern for evolution and progress. But how fast is that progress absorbed by the other segments of the utility industry? How rapidly does the industry allow itself to be seduced away from the conservatism that has been established from records for plant dependability and availability?

Well, survey shows that the power plant designers in these United States are progressive conservatives. By and large the radical pioneers are relatively few in number and thereby stand out. The great majority of plants of current vintage show movement cautiously away from the tried and proved features of the immediately preceding period. Evidence of this methodical progress is found when Electrical World's latest Steam Station Characteristics Survey in this issue is compared with the immediately preceding one (April 7, 1952).

Gradual resort to the following items of progress is recorded: outdoor location of major equipment, moderate shift toward higher pressures and temperatures, more resort to reheat, more adoption of demineralization for feedwater, continued application of functionally arranged control boards. None of these transitions has any of the characteristics of a stampede or avalanche. In short the utility industry is making steady progress but, in general, unspectacularly. While others are proving the merits of startling innovations the average utility is clinging to designs that reflect cautious injection of departures that might conceivably sacrifice more in reliability than they contribute in economy. It is probably a wholesome attitude for the core of the utility industry to take.

Boston Edison Takes Front Page Ads to Keep Public Informed

Hurricane Carol struck the Boston area leaving more than one million customers without electric service. But they were not left in the dark about Boston Edison Co's heroic efforts to restore service.

For eight straight days in front-page advertisements (some Boston papers carry them regularly) and through lead news stories, the company gave a day-by-day account of its progress in rehabilitating its system.

Beginning the day after the storm hit, a large front-page advertisement in the Boston Herald told the company story. It began, "Since early Tuesday when the hurricane struck, crews of Boston Edison Company have been working to restore the electrical service of as many customers as humanly possible—with hospitals and other critical public-service agencies receiving priority." A sub-head on the lead news story on the same page reported, "Power Loss Perils Half the State."

Daily progress reports on storm damage repairs were carried in the front-page advertisements with the exception of one day when the ad ran on page three. Front-page news and a human-interest feature supplemented these communiques. Each of these advertisements carried an up-to-date count on the number of services restored during the previous 24-hour period and the number still to be restored.

By the eighth day following the storm, a front page news story reported that about 99% of the power customers were receiving power, and the final ad in the hurricane series was headed "Our Sincere Thanks."

This is as good an example as we are likely to find of a disaster-struck utility keeping its customers fully informed of its situation and its progress. As Florida Power & Light Co pointed out in a recent article (EW, Oct. 4, p 71), a well-planned public relations program is a key feature of any system rehabilitation program.

But if you take a page out of the Boston Edison book, it will have to be a front page.

PROGRESS REPORT #7
TO CUSTOMERS OF
BOSTON EDISON COMPANY

At eight o'clock Monday night about 97 per cent of Boston Edison Company's 450,000 customers had electricity in their homes.

Our workers toiled throughout the holiday to keep the restoration moving at a rapid pace.

THE ELECTRICAL WEEK

The Issue's News Highlights . . . Joint Congressional Committee on Atomic Energy postpones until Nov. 4 its hearing on Dixon-Yates contract . . . SEC witness tells Langer anti-monopoly hearing that Mississippi P&L bookkeeping practices conform with FPC rules.

Two Commonwealth Edison power plants in Chicago are forced to shut down as result of heavy rains.

Argonne National Laboratory announces boiling water reactor plant will be built in Illinois.

Rumor is going the rounds Dow Chemical Co may drop out of Dow-Detroit Edison atomic power study group either to begin an independent study or a joint study with other chemical firms. Vitro Corp, which has a study contract for fuel element reprocessing, may turn it into a joint study, but other participants are still to be chosen.

Public security offerings of electric utilities totaled $1.84 billion for the first nine months of 1954 as compared with $1.35 billion for the like period of 1953, Reis & Chandler, Inc, has reported. Of the $1.84 billion, $1.39 billion was "new money" compared with $1.34 billion for the first nine months of 1953.

Inter-Industry Farm Electric Utilization Council meetings in Columbus, Ohio, and Ft Worth added still more states to 17 which now have committees formed to push rural electric sales. Regional meetings in these two cities followed earlier ones in St Paul and Denver. Nashville will be the scene of fifth on Oct. 20.

Pennsylvania P&L and Pennsylvania W&P directors approved a pact to merge PW&P into PP&L. Each PW&P common share will get ¼ share of PP&L 4.40% preferred and ½ share of common. PW&P preferred stocks will be redeemed.

Washington Water Power has offered to buy out Stevens County Public Utility District for more than $2 million, and the PUD has promised a thorough study of the proposition.

American Nuclear Society has been formed, consisting of scientists and engineers working in the atomic field. Some of the members are Philip Sporn, American G&E; R. A. Bowman, Bechtel Corp; Dr Karl Cohen, Walter Kidde Nuclear Laboratories; Walter Friend, Ebasco Services; Dr K. H. Kingdon, GE Laboratory; W. E. Kingston and S. B. Roboff, Sylvania Electric Products; J. W. Landis, Babcock & Wilcox; T. LeClair, Commonwealth Edison; Dr C. R. McCullough, Monsanto Chemical; J. R. Menke, Nuclear Development Associates; M. A. Schultz and Dr W. E. Shoupp, Westinghouse Electric; and Dr Chauncey Starr, North American Aviation.

Off the Washington Wire . . . REA and rural electric co-ops are now in on the atomic energy program on a day-by-day basis . . . San Francisco PUC and Tuolomne Irrigation District No. 2 have carried their feud over the Hetch Hetchy project to Washington . . . City of Seattle has asked FPC for an amendment to its license to add a fourth 90,000-kw generator at the Ross Station on the Skagit River in Whatcom County, Wash.

Five utilities belonging to Puget Sound Utilities Council have approved a contract which had been proposed by AEC for organization of a group to study proposed establishment of an atomic energy plant in Washington State.

Interior Department approved an emergency short-term contract for sale of Falcon Dam power to Central P&L, Corpus Christi, Texas. FPC also approved an average rate of 2.7 mills per kwhr. Preliminary operations have indicated an expected delivery of 11 million kwhr a month.

Chugach Electric Association, Anchorage, Alaska, will ask FPC for a preliminary permit to build a 12,000-kw hydro plant on Kenai Peninsula.

Arizona Public Service has sold privately 75,000 shares of $100 par $4.35 cum preferred stock . . . Tampa Electric plans a 3-for-1 common stock split . . . New York State Power Authority plans to sell about $315 million of revenue bonds for St Lawrence project . . . Middle South Utilities' 475,000 common stock offering on a 1-for-15 basis at $28 a share was heavily oversubscribed . . . Central Ohio L&P asks PUC approval to reduce rates by $258,799 a year.

UWUA votes to accept a two-year contract of Virginia E&P offering a $5 a month pay hike. By accepting this offer, clerical, professional, and technical employees rejected a proposal that would have given a flat $8 a month raise with the loss of two half holidays.

Wiring modernization plan, allowing installment payments for homeowners has been launched by The Electric Association of Kansas City, Mo.

Five Year Department of Agriculture census is now being taken of nation's 30 million farmers. Data will be made available to the public by Census Bureau in 1955.

Steam generation (slightly over 17 billion kwhr) has exceeded hydro (slightly under 13 billion kwhr) for the first time in its history, TVA has reported.

Executive Changes . . . M. H. Lovelady, chief engineer of Central Power and Light, elected vice president.

Election Recess Called on Dixon-Yates

Joint Committee Hearing Off Until Nov. 4

A Congressional showdown on the Dixon-Yates proposal will be delayed until after the November elections. Both Democrats and Republicans on the Joint Congressional Atomic Energy Committee voted to postpone hearings on the contract until after the campaign.

Atomic Energy Commission and the Dixon-Yates group are now satisfied that they have a workable contract in final form. It is also known that Federal Power Commission, which has been in day-to-day contact with AEC on the matter, has approved engineering details of the contract. AEC asked the Joint Committee to hear its request for a waiver to permit an early signing this fall, and chairman W. Sterling Cole (R-N. Y.) scheduled a meeting for Oct. 13, appointing Vice Chairman Bourke Hickenlooper (R-Iowa) to run the show.

Hickenlooper was advised by committee members, however, that they could not attend in sufficient numbers until the elections were over. The senator reset the meeting for Nov. 4, two days after the elections.

When the meeting is held, details of the agreement will be made public for the first time. Moreover, details of a follow-up arrangement between AEC and TVA, which will be charged with wheeling the 650,000 kw of new power from the proposed Dixon-Yates plant at West Memphis, Ark. to the AEC plant at Paducah, Ky., may be released.

AEC-TVA in Accord

AEC and TVA have bickered for months over this wheeling proposal, but last week they reached agreement and a contract was in the works. Two Democratic holdovers on TVA—Directors Harry Curtis and Raymond Paty—finally agreed to go along with the new chairman, Herbert Vogel, and the AEC in working out an arrangement whereby TVA will receive certain "benefits" under the AEC-Dixon-Yates contract, for which TVA will foot the bill.

It was apparently the fact that this agreement was in sight which prompted the AEC to ask for the Joint Committee hearing.

Sen Estes Kefauver (D-Tenn.) asked Cole for permission to appear as a witness when the waiver hearing is held. He said he wants to review testimony submitted by J. D. Stietenroth, ousted secretary-treasurer of Mississippi Power & Light Co, before the Langer anti-monopoly subcommittee. Mississippi P&L is a subsidiary of Middle South Utilities, a principal in the Dixon-Yates contract. Kefauver also wants to protest the waiver and demand that the Joint Committee await the report of the Comptroller General as to whether practices of Middle South Utilities would justify blacklisting of the firm for government contract work. Sen William Langer (R-N. D.) requested the investigation by the Government Accounting Office.

The Tennessee Democrat also asked Cole to hear representatives of cooperatives and other power distributors in the TVA area.

Democrats were continuing to lambast the disputed contract. National Chairman Stephen A. Mitchell told a Virginia political rally that re-election of a Republican Congress in November would result in "another Dixon-Yates project to pump higher-cost power into this end of the Tennessee Valley on the pretext of serving Oak Ridge." He said the Eisenhower Administration, backed by a Republican Congress, would enter into more contracts of this type—"and that means the gradual destruction of the TVA as a yardstick operation."

MP&L Cleared on Bookkeeping

SEC Says Firm Follows FPC Rules

Securities and Exchange Commission officials have testified before Sen William Langer's anti-monopoly subcommittee that Mississippi Power & Light Co's bookkeeping practices are in conformance with federal regulations. The Langer group is investigating charges of irregularities in the relationship of Middle South Utilities to its subsidiary, Mississippi P&L, made by J. D. Stietenroth, ex-MP&L secretary-treasurer (EW, Oct. 11, p 6).

Stietenroth last week wound up his charges that Mississippi P&L is dominated by Wall Street.

Langer set today, Oct. 18, as tentative date for next meeting of the subcommittee but gave no hint as to whom he would call as witnesses. As of late last week Middle South and Mississippi P&L officials had not received subpoenas to appear.

SEC's Division of Corporation Financing related to the subcommittee that on Sept. 30 Charles W. Smith, chief of the Federal Power Commission Bureau of Accounts, Finance and Rates had said he was satisfied that Mississippi P&L was keeping its books in accordance with the FPC uniform system of accounts and that reports on FPC Form 1 were in agreement with the published reports to stockholders.

SEC officials also testified that Middle South figures challenged by Stietenroth were not considered material in terms of Middle South's common stock financing of 475,000 shares. Middle South registration statement became effective Sept. 23.

Middle South got a clean bill of health from SEC so far as its stock registration statement was concerned.

Byron D. Woodside of SEC testified he called on all parties concerned with the Middle South registration on Sept. 23. In a telephone conversation with Stietenroth, he tried to get specific charges.

"I think we did our job," said Woodside. "I would not have recom-

mended that a case be cleared until I was satisfied that there was a reasonable basis. I would not have recommended the case be cleared if I had not thought that we made sufficient attempt to get at the bottom of Stietenroth's charges."

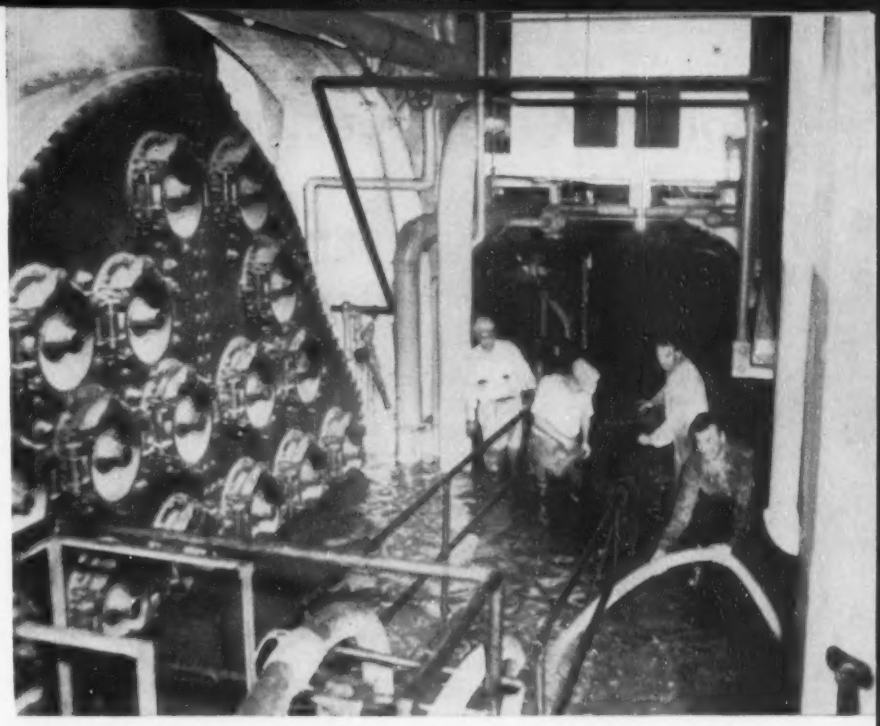
In his final appearances before the Langer subcommittee, Stietenroth made these additional charges:

- Ebasco Services, which does most of the Middle South's engineering and related construction services, received excessive fees from Mississippi P&L which could not retain another agent because of Middle South's control.
- Middle South ordered Mississippi P&L funds transferred from reserve to surplus in order to provide for a stock dividend. Stietenroth said this cut the Mississippi utility's reserve funds to a critical point, and declared that the firm may already be bankrupt.
- Mississippi P&L depreciation rates varied for the same items. He said steam generators' depreciation was listed as 35 years in an AEC report, 40 years on its current books, 50 years in SEC registration statement, and 31 years on its tax books.

REA Statement

In another development relating to Stietenroth's charge that Rural Electrification Administration was joining with Mississippi P&L to force Northcentral Mississippi Electric Power Association out of business, Agriculture Department reviewed REA's dealings with the co-ops.

The statement declared that an REA supervisor has been working with the co-op's board of directors since last January in an attempt to straighten out its finances. Several proposals have been made and discarded, said REA, but the only one which is still before the board of directors is one through which the association's facilities would be taken over by Mississippi P&L and an adjacent electric cooperative. This plan, submitted to Northcentral on July 7 by Mississippi P&L and REA, would provide continued electric service to all Northcentral consumers, result in a sizeable number of Mississippi P&L rural consumers being transferred to an adjacent co-op, meet all obligations and deficits of Northcentral, and repay in full the amount loaned by REA, according to REA.



COMMONWEALTH EDISON workmen pump water from Fisk Plant's generator room

Floods Shut 2 Chicago Plants

Commonwealth Edison's Fisk and Crawford Stations forced to halt operations. Power to big users is limited

Chicago's heaviest rainfall on record forced shutdown of Crawford and Fisk power stations of Commonwealth Edison Co on Sunday, Oct. 10. Capacity of the two plants is 800,000 kw, representing 25% of utility's total generation.

The rains, which caused an estimated damage of $10 million, totaled about seven inches in 28 hours. In addition to the Chicago River, which runs through the heart of the city, scores of creeks and drainage ditches overflowed throughout the metropolitan area.

The canal on which Crawford and Fisk plants are located overflowed its banks. Because of this overflow, auxiliaries at Fisk plant were flooded, forcing a shutdown at 6 pm Sunday. Crawford was shutdown an hour later.

While Commonwealth Edison maintained service without interruption, it called on large consumers to cut their use of power. Sixteen big industrial plants closed down on Monday, Oct. 11, to conserve power, but subsequently received 50% of the power they normally use. Other concerns were getting 50% of their power needs at first and then, when conditions improved, 75%. The utility expected to resume normal operations this week.

System load at 8 am Monday, Oct. 11, was 2.7 million kw, which was 350,000 kw under normal load at that time for a Monday morning. Commonwealth called on tie-line facilities for all the capacity it could obtain in order to meet demands.

The utility reported there was no damage to turbines, generators, or boilers at the two plants. Main trouble came from flooding of auxiliary equipment.

92.3% of Farms Electrified

Rural Electrification Administration's yearly tabulation of the number of electrified farms shows that 92.3% of U. S. farms had electric service as of June 30 this year. This is a jump of 1.5% over last year and 15.1% over farm electrification revealed in the 1950 census. REA said there were 416,172 unelectrified farms in this country as of June 30, compared with 493,674 a year earlier.

Boiling Water Reactor Plant Set

Allis-Chalmers named by AEC to design, construct power generation, heat transfer for experimental station in Illinois

Argonne National Laboratory, operated for Atomic Energy Commission by the University of Chicago, announced last week that Sargent & Lundy, Chicago, has been selected as the architect-engineer for the design of the experimental boiling water reactor which has been authorized as part of the commission's five-year program for development of competitive electrical power from nuclear fuel.

Allis-Chalmers Manufacturing Co, Milwaukee, has been chosen to design. develop, construct, and install the power generation, heat transfer and special equipment for the power cycle.

Capacity: 5,000 Kw . . . The experimental boiling water reactor (EBWR) which will be built on the Argonne site in Du Page County, Ill., will produce 20,000 kw of heat and 5,000 kw of electricity. The reactor will use slightly enriched uranium fuel and will be moderated and cooled by ordinary water. Plans call for construction to start during the coming year with completion scheduled for 1956.

AEC has estimated the cost of this experimental reactor at approximately $17 million. Reactor experts have rated it as a "middle-term" project capable of large-scale testing within a five-year period.

Investigations Promising . . . Development and construction of the reactor follows promising investigations conducted by the Argonne research staff in the past two years during which a small temporary reactor converted water into steam directly without the use of an intermediate heat exchanger. These studies, as well as many other investigations conducted by Argonne, are aimed at producing electrical power from nuclear fuel so that this new fuel can be used economically to supplement conventional fuels in meeting the nation's demand for electric energy.

Advantages claimed for the boiling-water reactor over the more conventional circulating-water reactor are: (1) the steam generator normally required for pressurized water reactors is eliminated; (2) pumps can be much smaller and less expensive because the only pump requirement in the primary circuit is that of returning water from the condenser to the reactor vessel; (3) the reactor will be operated at a lower pressure and lower maximum temperature than pressurized water reactor systems, thereby simplfying both fuel and structural materials problems.

The laboratory will coordinate the work of the project for AEC and will design and construct the reactor core and the reactor control mechanism.

Special Sealing Devices . . . Allis-Chalmers, under its contract, will develop components of a power system provided with special sealing devices which will make the components tight against leakage of steam, air, or water. The development of power plant components from which leakage of primary steam and water is held to virtually zero is desirable from an operating standpoint. In addition, such a development will make possible the use of heavy water (D_2O) instead of light water (H_2O) in the boiling water system. Heavy water possesses important nuclear advantages but is expensive. The cost of power from nuclear plants might be reduced significantly by using heavy water if techniques for eliminating leakage of the heavy water can be perfected.

The experimental boiling water reactor is to be a small scale pilot plant and the electricity produced will not be competitive with power from large central-station plants. The information gained from its construction and operation is expected to contribute significantly toward the goal of commercial nuclear power.

Changes in Capacity Reported to FPC

PLANT ADDITIONS DURING AUGUST

State	Utility	Plant	Fuel	Capacity (Kw)
Conn.	Hartford Electric Light	Middletown	S	66,000
Pa.	Ford City Municipal Electric Light Plant	Ford City	IC	1,245
Ohio	Cleveland Electric Illuminating	Eastlake	S	100,000
Ill.	Electric Energy Inc	Joppa	S	156,000
Ill.	Commonwealth Edison	Ridgeland	S	150,000
Mich.	Charlevoix Municipal Utilities	Charlevoix	IC	1,000
Wis.	Cumberland Municipal Utilities	Cumberland	IC	1,360
Mo.	N. W. Electric Power Cooperative	Missouri City	S	40,000
N. C.	Duke Power	Riverbend	S	133,000
Fla.	Florida Keys Electric Cooperative Association	Tavernier	IC	2,000
Ky.	Owensboro Municipal Utilities	Owensboro	S	30,000
Tenn.	Tennessee Valley Authority	Douglas Dam	H	26,000
Miss.	Yazoo City Public Service Commission	Yazoo City	S	11,500
Ark.	Hope Water & Light Plant	Hope	S	2,500
Ark.	Arkansas Power & Light	Harvey Couch	S	135,000
Okla.	Ponca City Municipal Water & Light Department	Ponca City	IC	3,620
N. M.	Farmington Electric Department	Farmington	IC	800
Ariz.	Tucson Gas Electric Light & Power	Demoss Petrie	S	40,000
Calif.	Pacific Gas & Electric	Pittsburg	S	156,250

PLANT RETIREMENTS DURING AUGUST

N. H.	New Hampshire Electric Cooperative	Norton (Vt.)	H	125
N. H.	New Hampshire Electric Cooperative	Norton (Vt.)	IC	100
Pa.	Ford City Municipal Electric Light Plant	Ford City	IC	500
Va.	Virginia Electric & Power	Woodstock 2	H	252
Va.	Virginia Electric & Power	Colonial Beach	IC	460
Tex.	Gulf States Utilities	Conroe	IC	50

H—Hydro, IC—Internal Combustion, S—Steam.
United States Capacity as of Sept. 1—Hydro, 22,802,359 kw; Internal Combustion, 2, 254,217 kw; Steam, 73,023,153 kw; Total, 98,079,729.

N. J. May Get an Edison

Raritan Township, N. J., will decide election day whether it will change its name to Edison, N. J., to honor Thomas A. Edison who perfected the incandescent lamp here 75 years ago.

New Bidding Plan

GE submits low bid for The Dalles units in first test of price adjustment formula

A price adjustment formula which eliminates the uncertainties of the old price escalation clause in government contracts has gotten off to a promising start with the opening of bids at Portland, Ore., for eight big generators for The Dalles Dam, Army Corps of Engineers' project on the Columbia River. New contract language puts all bids on a directly comparable firm price basis by tying price adjustment to independent Labor Department indexes for labor and materials.

The new formula was worked out jointly by Corps of Engineers and Bureau of Reclamation after consultation with manufacturers. Both agencies will use it in asking for equipment bids.

U. S. Firms Win in 1st Test . . . U. S. manufacturers outscored foreign competition in the first test of the new price escalation method. General Electric Co at $11,115,620 beat the second among six bidders—the English Electric Export & Trading Co, Ltd—by nearly $2 million. The English firm bid $13,277,269, closely followed by Tokyo Shebaura at $13,895,848 and Allis-Chalmers Manufacturing Co at $13,939,110.

If you apply the 25% differential of the Buy American Act, the two foreign bids would be higher than even the Allis-Chalmers price.

Fifth bid, by the Elliot Co of Jeannette, Pa., amounted to $15,050,904. Westinghouse Electric Corp bid $15,666,265, but took exception to the new price adjustment provisions and refused to follow it.

U. S. manufacturers since the war have demanded the protection of price escalation on long-lead-time items such as generators and turbines. Government contracts generally have permitted escalation up to 20% above the bid price for 36-month delivery, 30% for longer lead time.

This kind of escalation posed serious troubles in evaluating bids, particularly where prices were offered by both foreign and domestic bidders. U. S. firms bid on an escalation basis —price to be adjusted at time of delivery—while foreign competitors offered firm price bids not subject to escalation. In comparing prices, the contracting officers had to make allowance for increases on escalated bids.

Foreign manufacturers' bidding firm prices enjoyed a big advantage. The 20% (or 30%) added to domestic bids pretty much cancelled out the 25% Buy American differential.

The government agencies, therefore, got some intermingling of foreign and domestic units on big projects.

This won't happen at The Dalles. There the Engineers called for bids both on four units and on eight units. They found out what they wanted to know, that the cost per unit is less for the larger contract. With GE almost assured of contract for eight 82,000-kva generators, the Engineers expect to complete this plant with a call for bids on six similar units.

The new formula works two ways: If cost indexes go up, the manufacturer gets more money; if they go down, the government recovers part of the contract price.

The new price adjustment formula applies to monthly estimates paid during the life of a contract as well as to final payment. Allowing 10% for overhead and profit, the price adjustment features govern 90% of the contract price—55% for labor and 35% for materials.

PEA Exhibit at Harrisburg Show

Pennsylvania Electric Association presented an exhibit on use of electricity in industry at first annual Industrial and Construction Exposition held last month at Harrisburg, Pa. Duquesne Light Co officials are shown inspecting one of the displays. They are (l to r) P. H. McCance, president; J. W. O'Nan; O. C. Brinkerhoff; and C. M. Colvin, who was chairman of Industrial Display Committee for PEA. O'Nan and Brinkerhoff were committee members.

Hells Canyon Brief Filing Is Set After Elections

The Federal Power Commission staff is holding up further development in the Hells Canyon dispute until after the November elections. This will put off until next spring a final decision on whether Idaho Power Co will get a license to build on the Snake River.

Delay is not aimed at avoiding entanglement in the Congressional races, but that is the effect of it. The FPC says engineering analysis of the conflicting proposals for developing the Snake River has taken longer than was originally anticipated. For this reason, the FPC engineering and legal staffs on Oct. 11 requested, and received a 30-day extension in the time limit for filing first briefs on the matter. This delays until Nov. 10 the submission of first briefs.

Idaho Power Co, the applicant which has asked for an FPC license to initiate a construction program involving three low-level dams on the Snake, objected to this second delay. The interveners—Lewis County PUD and National Hells Canyon Association—as well as Washington State, indicated they were satisfied and could utilize the extra time to complete briefs.

PUBLIC RELATIONS & ADVERTISING

Sunday's the Night for Jubilee TV

"Light's Diamond Jubilee" television show—its content still "the best kept secret in Hollywood"—will be unfolded on millions of TV screens across the nation next Sunday evening over the biggest network in TV history.

At least 325 stations on all four major video webs will carry the two-hour-long salute to the 75th anniversary of Thomas A. Edison's invention of the first successful incandescent lamp. Stars like Helen Hayes, Joseph Cotten, Eddie Fisher, Judith Anderson, Thomas Mitchell and Guy Madison only begin the roster of famous names who will appear. President Dwight D. Eisenhower will deliver a Jubilee message in a specially filmed portion of the show.

Behind the giant production is David O. Selznick, a man to whom big things ("Gone With The Wind," "Duel In The Sun") is old stuff. Selznick still wouldn't reveal the show's exact nature at press time, but said that it will be "an entertainment tapestry woven around the theme of light." It is his first television production.

Furnishing the show's final script is noted dramatist Ben ("The Front Page") Hecht. He will incorporate the efforts of other such top-rung writers as Irwin Shaw, Max Shulman, and John Steinbeck into one master treatment. Directors are William Wellman and King Vidor.

Backing it up with music will be Victor Young, directing a specially assembled orchestra in an original score. Other creative notables working behind the scenes with Selznick: Designer Firth Ullman who will stage more than 40 settings, Cinematographers James Wong Howe and Ray June and Carey Wilson, well-known science film producer.

Sponsors are some 300 companies and organizations of the electrical industries. Show is being coordinated by Light's Diamond Jubilee Committee and its agency, N. W. Ayer & Son, Inc.

Times for "Light's Diamond Jubilee" next Sunday (Oct. 24) are as follows: Eastern Standard Time zone—9 to 11 pm; Central—8 to 10 pm; Mountain—7 to 9 pm and Pacific—6 to 8 pm. ABC, CBS, DuMont and NBC all will carry it.

PRODUCER DAVID O. SELZNICK (seated second from left) delves into electrical research with industry personnel in preparation for "Light's Diamond Jubilee" television show. The two-hour-long presentation has required months of planning, talent coordination

BRANDON DE WILDE is one of the stars

GUY MADISON, Kim Novak also will appear

Jubilee Activities Reach Peak

This week special TV shows, plant dedications, industry banquets will mark 75th anniversary of incandescent lamp

Celebration of Light's Diamond Jubilee hits its peak this week as civic, state, local, and electric company officials in every part of the nation join to mark the 75th anniversary of the first successful incandescent lamp.

Los Angeles is the largest city to have the week of October 17 officially proclaimed Electrical Week. There Mayor Norris Poulson called on all citizens to "take cognizance of the contribution these pioneers in the electrical industry have made."

In other parts of the country this climax of the five-months observance is being marked by special radio broadcasts, magazine articles, plant dedications, advertising campaigns, luncheons, dinners, and contests. Together it adds up to the most intensive anniversary observances put on by the electrical or any other industry in recent history.

Here is a sampling of events scheduled for this week: in addition to the "Diamond Jubilee of Light" extravaganza (see story on opposite page):

Network television . . . TV programs saluting the Jubilee celebration or the Edison story include the "Studio One" on CBS Oct. 18 which will present a story of Edison's boyhood. On Oct. 21, these TV shows will carry a salute: The "Jane Froman Show" on CBS, "Johns Hopkins Science Review" on DuMont, "Home Show" on NBC, and "Today" on NBC.

Jubilee Dinners . . . Luncheons and dinners commemorating the anniversary of the first successful lamp are to be held in a dozen cities under sponsorship of electric companies and other groups. These include a luncheon Oct. 18 in Baltimore sponsored by Consolidated Gas Electric Light & Power Co of Baltimore; luncheon in Chicago Oct. 21 sponsored by Commonwealth Edison Co and the Electrical League; banquet in Cleveland Oct. 21 sponsored by Cleveland Electric Illuminating Co and General Electric Co; luncheon in Detroit Oct. 18 arranged by the Electrical Association of Detroit; dinner at Greenfield Village near Detroit Oct. 21 to celebrate the Jubilee and the 25th anniversary of the Ford Museum; luncheon in Los Angeles Oct. 21 arranged by the Junior Chamber of Commerce and Southern California Edison Co; banquet in New Orleans Oct. 21 arranged by the Electrical Association.

Plant Dedications . . . Electric companies in ten states will salute the anniversary by dedicating new steam generating plants or additional units. Companies which will participate in this manner include:

Bangor Hydro-Electric Co—Graham Station at Veazie, Maine, Oct. 21.

Boston Edison Co—Addition to Edgar Plant, Oct. 21.

Carolina Power & Light Co—Wilmington Plant, Oct. 21, with North Carolina Gov William B. Umstead delivering the main address.

Detroit Edison Co—New unit at St. Clair Plant, Oct. 21.

Ohio Edison Co — Niles Power Plant, Oct. 21.

Pacific Gas & Electric Co—Pittsburgh Plant, Oct. 21.

Public Service Co of Colorado—Press tour of Zuni Station, Oct. 21.

Rochester Gas & Electric Corp—Open House at new Russell Station, Oct. 21.

San Diego Gas & Electric Co—Encina Plant at Carlsbad, Oct. 19.

Virginia Electric & Power—Addition to Portsmouth Plant, Oct. 21.

Newspapers, Magazines . . . Special newspaper sections have been arranged by Cleveland Electric Illuminating, New Orleans Public Service Inc, San Diego Gas & Electric, Union Electric Co of Missouri, Wisconsin Electric Power Co and Wisconsin-Michigan Power Co.

Special employee magazine issues commemorating the anniversary have been published by Cleveland Electric Illuminating, Detroit Edison, Niagara Mohawk Power Corp, Northern Pennsylvania Power Co, Ohio Edison Co, Public Service Electric & Gas Co, Public Service of Colorado, St. Joseph Light & Power Co, Texas Electric Service Co, Union Electric, United Illuminating Co, Utah Power & Light Co, Western Colorado Power Co, and Wisconsin Electric.

Interior Prodded on Clark Hill

Georgia co-op group bids Interior Department make a decision on who shall get power from federal hydro project

With Election Day just two weeks away, Georgia Electric Membership Corporation is sure that Interior Department is stalling its decision on who gets Clark Hill power in order to keep from bobbling a political hot potato.

Last week, GEMC sent another letter to Interior Assistant Secretary Fred Aandahl restating its proposals to handle Clark Hill power and again asking for the decision that's been forthcoming for six months now. What prompted the letter, signed by GEMC Pres Marshall Pollock, was an earlier letter from Aandahl (EW, Oct. 11, p 5) which informed the Georgia co-ops that a contract could not be signed until the group presented "some plan whereby (they) can transmit and deliver the power to member cooperatives and collect the money needed to make payment to the government."

Denies 'Politics' Charge . . . Aandahl denied that politics was playing a part in the issue. He said, "From the beginning we have made every effort to resolve this problem on its merits and to keep it out of politics." The assistant secretary told GEMC President Pollock that "if you expect to buy this power for your members, the next move would be for you to establish ability to firm it, transmit it to them, and to pay for it."

Aandahl was referring to GEMC proposals for taking Clark Hill power which, in effect, propose only to take title to the power. The co-ops claim once they have title to it, they will be able to firm it and deliver it to their customers. Behind the GEMC proposal is the firm belief that if the co-ops gain title, Georgia Power Co will agree to wheel the power rather than face the possibility of competing lines being constructed.

Threaten Court Fight . . . The co-ops, what's more, are staking their entire fight for the power on this premise. And they have clearly indicated that should Aandahl decide in favor of selling Clark Hill power to Georgia Power, they will take the matter to the courts to gain title under Section 5 of the Flood Control Act of 1944. That means a test case of the preference clause.

According to Interior, the GEMC proposal is "entirely dependent for its workability upon one of two alternatives, that is, either upon extended litigation to compel existing facilities to carry the power for (GEMC members) or upon a large construction program by the (GEMC) to carry it." Actually, the GEMC stand is based on the first alternative only. They have little intent at this time to construct transmission facilities of their own.

The only modification of their original proposal to Interior made in Pollock's latest letter was a suggestion that if the co-ops are given title to the power, the assistant secretary set "a reasonable period of time" in which the GEMC would arrange to have the power firmed and wheeled by Georgia Power.

Decision After Election Day . . . As it stands right now, betting is that Aandahl will approve, after Election Day, the tri-party contract which calls for delivering the power to Georgia Power which in turn would sell it to the co-ops at prices fixed by Interior Department.

That being so, the co-ops will go into court to test the preference clause.

The kicker is that the same law and the same clause specifies that Interior Secretary sell federal power to co-ops and the government in a manner that's "consistent with sound business practices." Interior Department if involved in litigation, will attempt to show that selling the power to co-ops which have no transmission facilities, is inconsistent with sound business practices.

Meanwhile, South Carolina Gas & Electric Co is taking all but a small portion of the power generated by Clark Hill Dam located on the Savannah River that separates the two states. Greenwood (S. C.) EMC has a firm contract with Interior for a small portion of the power. Georgia Power, which has been taking Clark Hill power under a temporary agreement, ceased to incorporate the power into its system earlier this summer. It refused additional contract proposals from Interior at a rate higher than the 5½ mills it was then paying.

Con Ed Buys Plant Site

Purchase of a 300-acre site near Peekskill, N. Y., at Indian Point for the construction of a large generating plant to meet anticipated power needs in expanding Westchester County has been announced by Consolidated Edison Co of New York, Inc. Present plan calls for use of conventional fuels, but utility reports suitability of the site for an atomic energy plant is being studied. Work on project is not expected to start for at least two years.

MEETINGS CALENDAR

NATIONAL ASSOCIATION OF SUGGESTION SYSTEMS
12th Annual Convention, Drake Hotel, Chicago, Oct. 18-19.

NATIONAL SAFETY CONGRESS-EXPOSITION
Conrad Hilton Hotel, Chicago, Oct. 18-22.

***PENNSYLVANIA ELECTRIC ASSOCIATION**
Fall Meeting, Electrical Equipment Committee, Hotel Robert Treat, Newark, N. J., Oct. 19-20; Fall Meeting, Communications Committee, Hotel Abraham Lincoln, Reading, Pa., Oct. 25-26; Fall Meeting, Meter Committee, Split Rock Lodge, White Haven, Pa., Oct. 28-29; Fall Meeting, Transmission and Distribution Committee, Alexander Hotel, Hagerstown, Md., Nov. 4-5.

ATOMIC INDUSTRIAL FORUM, INC
Meeting On "Atomic Opportunities in New England", in conjunction with New England Council, Statler Hotel, Boston, Oct. 20.

INTER-INDUSTRY FARM ELECTRIC UTILIZATION COUNCIL
Chairman Fred H. Strong, REA Deputy Administrator. Meeting: Southeast Area, Andrew Jackson Hotel, Nashville, Tenn., Oct. 20.

OKLAHOMA UTILITIES ASSOCIATION
Electric Light and Power Division, Western District Meeting, Duncan, Okla., Oct. 21; Electric Light and Power Division, Eastern District Meeting, Ada, Okla., Oct. 22.

***NATIONAL RURAL ELECTRIC COOPERATIVE ASSOCIATION**
Region X, Hilton Hotel, Albuquerque, N. M., Oct. 21-22; Region VII, Shirley-Savoy Hotel, Denver, Colo., Oct. 25-26; Region IX, Boise Hotel, Boise, Idaho, Oct. 28-29; Region VIII, Jung Hotel, New Orleans, La., Nov. 4-5; Region II, General Oglethorpe, Savannah, Ga., Nov. 8-9.

(*Continued on page* 198)

FINANCIAL

Utility Rate Impact

Ebasco's R. S. Quig discusses this subject at AGA meeting in connection with liberalized depreciation provisions

The impact on utility rates and regulation of the liberalized depreciation provisions of the new federal income tax law was discussed by R. S. Quig, assistant manager of rate department, Ebasco Services, Inc, before the annual convention of the American Gas Association last week.

He reminded the AGA members of the recent statement of Secretary of the Treasury George M. Humphrey, who said, on the subject of the new Revenue Code of 1954, that it was ". . . one of the most important of our time, for it sets a trend that will affect the prosperity of everyone of us; it clears the way towards greater economic progress for the entire country".

New Tax Law Significant . . . Quig continued, "The policy statement by the Congress and Secretary of the Treasury Humphrey's appraisal of the new tax law should be significant to the policy makers of utility companies and to those who advise on matters affecting the companies' policy decisions. It should be equally significant to all regulatory authorities. I say this because experience in connection with past situations of tax deferrals utilized by utility companies demonstrates that many lose sight of the overall policy and intent, and soon become embroiled in accounting detail and tax detail which 'exhaust but do not enlighten'."

After giving a brief description of the liberalized methods of tax depreciation, Quig analyzed the effect of these methods on utility rate making. He said ". . . use of the liberalized tax depreciation provisions when compared with the straight line method results in a deferral of the federal income tax expense liability and permits the company to generate more cash earlier in the life-cycle of the property."

Quig continued, "The $64 question before utility management is—will the state and other rate regulatory authorities permit the benefits which Congress intended, and which the Secretary of the Treasury has said will benefit the entire nation, to be retained by the utility. In principle, the question is not fundamentally different from that of accelerated amortization.

"A number of state commissions, as well as the Federal Power Commission, have issued orders affecting accounting for accelerated amortization. All state regulatory commissions and the FPC which have had occasion to rule on the rate making aspects of amortization of emergency facilities, have ruled in favor of use of normalized taxes and, except in one case, have not considered the accumulated tax deferrals as a rate base deduction. Hence, it is difficult to see how in consistency or equity any regulatory body could rule adversely in the present situation."

Liberalized Depreciation Methods . . . Quig pointed out, "The liberalized depreciation methods, permitted for calculation of income taxes, do not measure loss in value of the property of a regulated utility. Therefore, a booking of the increased depreciation 'expense' used in the income tax calculations is not a proper charge against the rate payers in the rate determination process.

"The only way that Congressional intent in granting liberalized depreciation for tax purposes can be fully implemented is for rate regulatory authorities to take into account for rate making purposes the income tax liability which would have occurred using the straight line method of computing depreciation for income tax purposes."

Quig concluded, "Under the influence of a 'cost of money' technique, along with many other cost concepts peculiar to purely accounting regulation, the utility business, both electric and gas, has been brought to a position where it can stand a 'new look' in the matter of return. But it should be clearly understood by all that any temporary benefits which might flow from the use of liberalized depreciations are not a substitute for an economically sound determination of what the rate of return should be in any given situation.

"Electric and gas utilities and other regulated industries must compete in the markets for new capital with non-regulated industry. If the investors in regulated industry are permitted the same advantages afforded to others from the new depreciation provisions of the tax code, the position of electric and gas utilities with respect to other industries will remain unchanged. However, if short-sighted considerations lead a regulatory commission to deprive utilities of these incentives, the companies affected may find it more difficult in the future, in competition with other types of industries, to raise funds needed for growth, modernization, and good service at reasonable rates to their customers."

Federal Laws . . .

. . . are forcing private capital to withdraw from power field, EEI Pres Quinton declares

Important changes in federal legislation designed to safeguard interests of customers of electric power utilities have been proposed by Harold Quinton, president of both Edison Electric Institute and Southern California Edison Co.

The correctives were suggested by Quinton when he addressed the annual convention of Indiana Electric Association held Oct. 6 at French Lick, Ind.

Scores Public Power Advocates . . . Quinton said that present laws placed on the statute books over the past several decades by the "scheming of professional federal government power proponents" are directed towards forcing private capital to withdraw from the power field and the eventual national socialization of the power industry.

The EEI president declared that the "most destructive" provisions of the existing legislation are those which create discriminatory taxation by exemptions granted to governmental proprietary power businesses. Quinton added: "Their customers are not then

called upon to bear the heavy share in the cost of government that users of electricity supplied by electric companies, along with all private business generally, are called upon to pay."

Decries 'Cheap' Federal Power . . . "Other statutory provisions give further preference to these same tax-exempted governmental proprietary businesses in the purchase of power from the federal government." Quinton continued, "This power is generally sold at about half its true cost, thus giving another substantial financial advantage to these privileged governmental proprietary businesses."

"Many other restrictions and discriminations," he said, "have been built into federal laws to handicap, discourage and drive private capital away from the power business. Thus alleged cheap government power becomes 'government high cost power'—the highest cost power the American people have ever purchased."

These changes in federal legislation were proposed by Quinton:

1. All federal power projects should be required by statute to include as part of the project and part of the operating costs such sums as would be payable as taxes by private enterprise carrying on the same or similar business.

2. Federal power projects or the part of federal multi-purpose projects realistically allocated to the power function should be made subject to local taxation the same as other property and business.

3. The tax exemption presently enjoyed by the proprietary power businesses of states, municipalities, public utility districts, and other governmental proprietary businesses should be removed.

4. Tax exemption presently enjoyed by such bodies from income taxes on income from securities issued to finance such businesses should be removed.

5. Laws governing the sale of power from federal projects need to be amended to require that power be sold at the point of generation at its fair market value and be allocated in proportion to the number of rural, residential, and retail commercial customers served by the respective applicants.

6. Federal Power Act should be amended to eliminate all duplicate regulation by the federal government.

(*More Financial on page* 244)

Today in Utility Finance

YIELDS (%)

Quality	Bonds			Preferred Stocks			Common Stocks		
	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
DATE									
Oct. 7	**2.88**	**2.90**	**3.09**	**3.88**	**3.99**	**4.36**	**4.49**	**4.78**	**5.17**
Sept. 30	2.88	2.90	3.10	3.89	3.99	4.38	4.50	4.80	5.19
END OF QTR.									
2nd 1954	2.90	2.96	3.19	4.03	4.14	4.48	4.72	5.04	5.45
1st 1954	2.82	2.87	3.14	3.88	4.09	4.42	4.83	5.19	5.42
4th 1953	3.07	3.12	3.34	4.17	4.32	4.62	5.07	5.57	5.51
3rd 1953	3.30	3.33	3.54	4.35	4.52	4.83	5.36	5.57	6.01

Data: Reis & Chandler, Inc.

EARNINGS

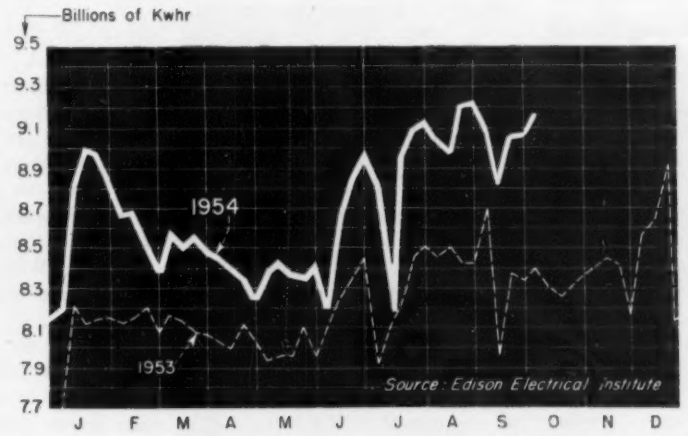
Company	Period Months	Ended	Net Income 1954	Net Income 1953	Earnings Per Common Share 1954	Earnings Per Common Share 1953
Arizona Public Service	12	Aug.	$4,564,000	$3,574,000	$1.53	$1.27
California-Pacific Utilities	12	Aug.	621,350	553,358	2.11(a)	2.01(a)
Consolidated Gas Electric Light & Power Co of Baltimore	8	Aug.	8,081,000	7,459,000	1.32(b)	1.32(b)
Dallas Power & Light	12	Aug.	5,520,406	4,973,363	.....	.....
Gulf States Utilities	12	Aug.	9,541,826	8,762,029	1.90(c)	1.71(c)
Iowa Electric Light & Power	12	Aug.	3,038,945	2,784,457	1.69	1.58
Middle South Utilities, consolidated	12	Aug.	15,595,243	13,876,357	2.19(f)	1.95(f)
Montana Power and subsidiaries	12	Aug.	7,600,905	7,728,082	2.64(g)	2.73(g)
Niagara Mohawk Power, consolidated	12	July	26,695,000	25,600,000	2.04(h)	2.04(h)
Public Service Co of Indiana	12	Aug.	12,071,320	11,348,406	2.34(i)	2.30(i)
Puget Sound Power & Light	12	Aug.	4,210,377	3,524,242	1.93	1.62
Tampa Power & Light	12	Aug.	2,705,949	2,603,789	3.78(j)	3.63(j)
West Penn Electric, consolidated	12	Aug.	15,305,558	14,414,955	3.62(k)	3.41(k)

Notes—(a) Based on 232,338 shares in 1954 and 228,298 shares in 1953; (b) Based on 5,559,681 shares in 1954 and 5,167,196 shares in 1953; (c) Based on 4,221,832 shares in 1954 and 1953; (f) Based on 7,125,000 shares outstanding; (g) Based on 2,481,665 shares in 1954 and 1953; (h) Based on 11,556,036 shares in 1954 and 11,139,369 shares in 1953; (i) Based on 4,251,060 shares in 1954 and 4,253,069 shares in 1953; (j) Based on 658,441 shares in 1954 and 1953; and (k) Based on 4,224,000 shares in 1954 and 1953.

FINANCING

Company and Description	Amount of Offering ($000)	Offering Price	Yield to Public
WEEK OF OCTOBER 7-13			
Bonds and Debentures			
Cleveland, Ohio—electric revenues due 1959-78	$5,000	various	1.20-2.40%
Eugene, Ore.—water and electric utility due 1959-78	1,000	various	1.20-2.35
Savannah Electric & Power—1st mtg 3¼% due 1984	5,000	102.52	3.12
Savannah Electric & Power—debs due 3¾% 1979	3,000	101.783	3.27
Central Louisiana Electric—conv debs 3½% due 1964 (being offered to common stockholders on the rate of $100 deb for each 27 common shs held of record Oct. 4; offering expires Oct. 27)	3,772	100.00	3.50
Preferred Stock			
Savannah Electric & Power—30,000 sh 4.36% $100 par	$3,000	$102.588	4.25%
SCHEDULE FOR OCTOBER—NOVEMBER—DECEMBER			
Bonds			**Bid Date**
Wisconsin Public Service—1st mtg due 1984	$12,500	.....	Oct. 14
Texas Power & Light—1st mtg due 1984	20,000	.....	Oct. 18
Louisiana Power & Light—1st mtg due 1984	18,000	.....	Oct. 20
Colorado Springs, Colo—water, electric and power revenues due 1957-82	10,000	.....	Oct. 20
Florida Power Corp—1st mtg due 1984	12,000	.....	Oct. 26
Florida Power & Light—1st mtg due 1984	10,000	.....	Oct. 27
Sierra Pacific Power—1st mtg due 1984	4,000	.....	Nov. 9
New Orleans Public Service—1st mtg due 1984	6,000	.....	Dec. 14
Wisconsin-Michigan Power—1st mtg due 1984	3,000	.....	.....
Kansas Power & Light—1st mtg due 1984	8,000	.....	.....
Preferred Stock			
Interstate Power—200,000 sh $50 par	$10,000	.....	Nov. 30
Common Stock			
Hawaiian Electric—50,000 sh (to be offered commonholders on a 1-for-13 basis without underwriting	.....	.....	.....
Virginia Electric & Power—600,000 sh (to be offered commonholders on 1-for-10 basis with an oversubscription privilege)	.....	.....	.....
Upper Peninsula Power—30,625 sh (to be offered commonholders on a 1-for-8 basis, record Oct. 26 to expire Nov. 10)	.....	.....	.....
ISSUES RECENTLY POSTPONED			
Bonds			
Gulf States Utilities—1st mtg due 1984	$24,000	.....	.....
Consolidated Edison Co of N.Y.—1st mtg due 1984	50,000	.....	.....
Preferred Stock			
Gulf States Utilities—160,000 sh $100 par	$16,000	.....	.....
Mississippi Power & Light—44,476 sh $100 par (to be offered in exchange for outstanding $6 pfd on a sh-for-sh basis, plus a cash difference between initial public offering price of new shares and redemption of the old shares; postponed because of pending investigation by the Senate. After Senate monopoly subcommittee renders statement, company will amend registration statement to answer charges made by its former secretary-treasurer, J. D. Stietenroth and proceed with the offering)	.....	.....	.....

STATISTICS



Output Week Ended Oct. 9——9,193,000,000 Kwhr

Per Cent Change from Previous Year

	Total US	New Eng.	Mid. Atlan.	Cent. Ind.	West Cent.	South-east	South Cent.	Rocky Mount.	Pacific NW	Pacific SW
Oct. 9	+10.7	−0.1	+4.7	+3.2	+7.8	+24.0	+23.0	−2.9	+10.4	+5.7
Oct. 2	+8.8	+0.1	+3.7	+2.0	+4.0	+22.5	+12.3	−2.9	+4.4	+9.1
Sept. 25	+8.6	−0.4	+3.8	+0.7	+5.8	+19.7	+19.5	−1.5	+5.3	+7.2

Seasonally Adjusted Index †175.5 Week Ago 174.8 Year Ago 158.6

Electric Power Statistics

		Latest Month	Preceding Month	Year Ago
Peak Load ‡(Million Kw)	June	78.0	74.0	73.0
Capacity (Million Kw)	Aug.	98.08	96.98	86.63
Production (Billion Kwhr)	July	40.08	38.90	38.07
Hydro	July	8.76	9.59	8.77
Fuel	July	31.32	29.31	29.30
Fuel Consumption:				
Coal (Million Tons)	July	9.40	9.29	9.59
Oil (Million Barrels)	July	4.45	4.29	6.34
Gas (Billion Cu Ft)	July	127.37	107.79	109.35
Sales (Billion Kwhr)	July	32.99	32.57	32.13
Residential	July	9.50	9.32	8.47
Commercial	July	6.52	6.03	5.81
Industrial	July	14.35	14.85	15.50
Other	July	2.62	2.36	2.35
Net Income Class A & B Companies ($ Million)	July	84.47	86.98	73.12
Estimated Dec. '54 Peak ‡(Million Kw)	July	88.1	88.1	91.9
Kwhr per Residential Customer (12 Month Average)	July	2,458	2,441	2,272
Revenue per Kwhr Residential Service (12 Month Average)	July	2.71¢	2.71¢	2.75¢
Canadian Production (Billion Kwhr)	June	5.67	5.93	5.26

Business Statistics

FRB Industrial Production Index†	Aug.	124*	116	136
Gross National Product Annual Rate ($ Billion)	2nd Qtr.	356.0	355.8	369.9
EW 4 Industry Production Index†	Sept.	117.0	115.4	124.9
ENR Construction Cost Index†	July	135.0	130.5	126.6
BLS Consumer's Price Index	Aug.	115.0	115.2	115.0
NEMA Insulation Materials Sales Index†	July	92	124	150
NEMA Electric Appliance Sales Index†	July	88	102	86
NEMA Household Refrig. Sales Index†	July	93	82	87
Metal Prices (Oct. 12)				
Copper, Conn., V., lb		$.30	$.29-3/4	$.29-3/5
Lead, N. Y., lb		.15	.14-1/2	.13-1/2
Zinc, prime Western E. St. Louis, lb		.11-1/2	.11-1/2	.10
Tin, Straits, qual. N. Y. lb		.93-3/8	.93-1/2	.80-1/2
Aluminum, ingot, base price		.22-1/5	.22-1/5	.21-1/2
Nickel, base price		.60	.60	.60
Steel, billets, Pitts., ton		64.00	64.00	62.00
Steel, scrap, No. 1 heavy, Pitts., ton		32.00	30.00	36.00

*Preliminary **Revised ‡Class 1 Systems †1947-49=100 ††1949=100

Business Briefs Suggest 1954 Pattern—Stability

The overall picture . . . Economic activity is holding its own at about the same rate as was in evidence last spring. Personal consumption and new construction continue to be the well-springs tiding over the declines in defense production and fixed business investment. The inventory-trimming in the durable goods industries continues to be the pattern, and serves to deter production—especially at the primary stages.

Construction . . . But the value of new construction put in place in August amounted to about $3.1 billion, seasonally adjusted. Private construction, representing about 71% of that, continued to increase—for the seventh consecutive month. Residential building is one of the key factors: the cumulative total of 770 thousand nonfarm dwelling units begun in the first seven months of this year was larger than in any other year except 1950.

Other building booms . . . commercial and private institutional building are still catching up with demand, and in turn, gain renewed impetus with the increases in residential building. Public construction, both in nonresidential building and highways is substantially ahead of comparable months in recent years. In fact, the only exception to the boom is in industrial building. Here there's been some tapering off after a period of heavy expansion programs.

Employment . . . There has been little change in August employment figures as the usual pickup in nonfarm jobs served to offset the seasonal drop-off in farm workers. The actual number on nonfarm payrolls showed an increase from July, though the gain was somewhat less than is usual for the month.

Prices . . . As a result of divergent price movements cancelling each other out, as well as lack of price changes in some areas, 1954 has evidenced an overall price stability. In the cost-of-living index, for example, July commodity prices were lower than January's, while prices for services and utilities, including rents, were somewhat higher.

WASHINGTON COMMENT

JESSE MOCK

The Congressional elections—now just two weeks away—will affect the present federal power policies no matter what the final outcome. However, few Washington observers expect to see any sweeping changes in power policy as a result.

Election Returns Will Affect Power Policy

If the Republicans manage to hold or strengthen their present majorities in both houses, prospects are that the Administration will seek to continue present policies and gain sufficient Congressional endorsement to implement them more fully. It will also press hard for authorization of such large federal projects as Libby Dam in Montana and perhaps attempt to revive the Upper Colorado River proposal.

A return of Democratic leadership in either one or both houses will certainly give the federal power advocates a more prominent forum but is not likely to change radically the tone of legislation or the amount of appropriations affecting federal power activities. A Democratic landslide in the Congressional election could result in a legislative-executive deadlock on federal power matters as the White House would continue to hold veto power over legislative changes.

Administration Leads Way . . . Major changes made in power policy have been initiated by executive agencies. In some cases the policy has been implemented by Congress, but much of it remains in the province of the executive. This is true of such important actions as those establishing the Missouri Basin power marketing criteria, reorganizing federal power marketing agencies, and setting forth Interior power policy which included the decision to step aside as a special pleader for a federal Hells Canyon project.

Congress can, of course, hamper some of these proposed changes, but without radical amendments to the law it cannot change the direction of this policy. This is mainly because Congress is confined to three main areas of activity, and the President, either by exercising initiative or veto power, has considerable influence over two of those areas.

Appropriations . . . By controlling the federal purse strings Congress may either encourage or hamper the construction of federal power facilities. It is doubtful that a Democratic majority would seek to throw open the Treasury door for federal power spending. During the latter years of the Truman Administration Democratic Congresses became increasingly economy-minded on this score. Even if a Democratic majority should loosen the purse strings, the White House still would have control over the rate of spending.

Authorizations . . . Through legislative authorizations and changes in existing laws Congress could clear a number of large power projects for construction and change existing legislative rules for marketing federal power. Previous Democratic Congresses have declined to vote out such controversial projects as Hells Canyon and Niagara redevelopment for federal construction. However the Democrats presided over by far the largest federal expansion of electric facilities in history. During recent years it has been the tendency of both Democratic and Republican Congresses to shy away from changes in basic law on such fundamental matters as marketing preference or the federal role in power development.

Investigations . . . Here Congress has a free hand. The executive can do little to curtail or influence the direction of Congressional investigations. A Democratic Congress would almost certainly use this investigative power for all it is worth. By controlling committee chairmanships in either one or both houses, the Democrats would be entrenched in protected firing positions to pepper Republican power policy at every turn. Even under Republican control, the Senate anti-monopoly subcommittee under Sen. William Langer has carried on a running and bothersome battle with the Administration over federal power policy.

There is this major consideration. The GOP policy, given a sympathetic Congress, is likely to get a fairer presentation and have a better chance to prove its merits. An unsympathetic Congress, out to make power policy an issue in the 1956 presidential campaign, will probably use every means to torpedo Republican policy and place it in an unfavorable light.

TECHNICAL NOTES

ARCHER E. KNOWLTON

Some 30 power reactors are operating around the world, and another dozen are under construction.

Field excitation set too low may cause overheating of the armature and structure of a turbine-generator. Avoidance is provided by an automatic lower limit incorporated in the rotating amplifier type of voltage regulator.

Radio noise complaints will be minimized if pole hardware is either solidly connected together or kept one inch apart, all hardware is tight, staples driven tight only on bare ground leads, and tie wires kept tight.

Average annual water temperatures at the bottom of the harbor regardless of depth or location is always within a few degrees of the average annual temperature of the air in Baltimore.

Voltage unbalance of a 3-phase transformer bank is primarily a function of the single-phase load on the bank and is relatively independent of the ratio of single-phase load to 3-phase load.

Complete automatization is expensive, and it does not necessarily guarantee improved operating reliability or saving of manpower.

Insulating oil requirements are 30 million gal per year (less than 1 million bbl). Fuel and lubricant requirements are 7 to 8 million bbl per day.

Smoke density is indicated in a new instrument which projects the standard of reference to a focal distance equivalent to that of the stack under observation.

$50,000 Initial Savings, Easier Maintenance . . .

These were the answers for Houston's Texas National Bank when its builder asked . . .

WHY 277/480-V BUILDING DISTRIBUTION?

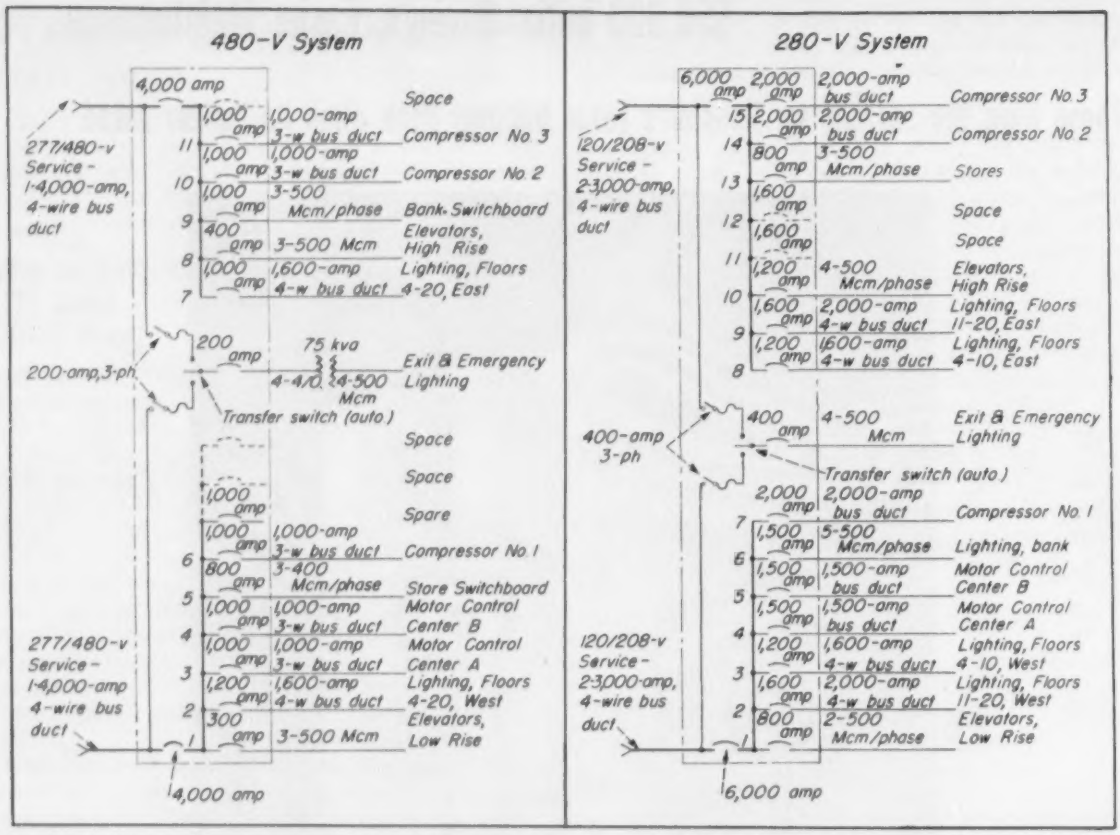
W. W. HENDERSON,
Bernard Johnson & Associates, Houston, Texas, and

H. N. HICKOK,
General Electric Co, Houston, Texas

Rapid growth in the use of electricity in office buildings has focussed the attention of building owners, architects, engineers, power companies, and contractors on the increasing cost of building distribution systems. These systems now represent 5 to 12% of the total building cost.

While plans were being drawn for Houston's new 20-story Texas National Bank Building, Houston Lighting & Power Co was studying the advantages of 277/480-v distribution over the conventional 120/208-v system. The 120/208-v service was available in the area where the building was to be constructed. It was not until the building owner had received bids and selected his electrical contractor that the power company completed its studies and offered 277/480-v service for the building.

This sequence of events caused a sharp comparison of costs and other features of the two systems. It resulted in installed costs of each system becoming available. Table I shows a savings in excess of $50,000 in favor of the higher voltage system. This system also provides easier installation and maintenance primarily because of a large reduction in weight and size of cable, bus duct, switchgear, and other devices.


480-V System
4,000 amp
277/480-v Service - 1-4,000-amp, 4-wire bus duct
Space
1,000 amp 1,000-amp 3-w bus duct Compressor No. 3
1,000 amp 1,000-amp 3-w bus duct Compressor No. 2
1,000 amp 3-500 Mcm/phase Bank Switchboard
400 amp 3-500 Mcm Elevators, High Rise
1,000 amp 1,600-amp 4-w bus duct Lighting, Floors 4-20, East
200 amp 75 kva 4-4/0, 4-500 Mcm Exit & Emergency Lighting
200-amp, 3-ph
Transfer switch (auto.)
Space
Space
1,000 amp Spare
1,000 amp 1,000-amp 3-w bus duct Compressor No. 1
800 amp 3-400 Mcm/phase Store Switchboard
1,000 amp 1,000-amp 3-w bus duct Motor Control Center B
1,000 amp 1,000-amp 3-w bus duct Motor Control Center A
1,200 amp 1,600-amp 4-w bus duct Lighting, Floors 4-20, West
300 amp 3-500 Mcm Elevators, Low Rise
277/480-v Service - 1-4,000-amp 4-wire bus duct
4,000 amp
280-V System
6,000 amp
2,000 amp 2,000-amp bus duct Compressor No. 3
2,000 amp 2,000-amp bus duct Compressor No. 2
800 amp 3-500 Mcm/phase Stores
1,600 amp Space
1,600 amp Space
1,200 amp 4-500 Mcm/phase Elevators, High Rise
1,600 amp 2,000-amp 4-w bus duct Lighting, Floors 11-20, East
1,200 amp 1,600-amp 4-w bus duct Lighting, Floors 4-10, East
120/208-v Service - 2-3,000-amp, 4-wire bus duct
400 amp 4-500 Mcm Exit & Emergency Lighting
400-amp 3-ph
Transfer switch (auto.)
2,000 amp 2,000-amp bus duct Compressor No. 1
1,500 amp 5-500 Mcm/phase Lighting, bank
1,500 amp 1,500-amp bus duct Motor Control Center B
1,500 amp 1,500-amp bus duct Motor Control Center A
1,200 amp 1,600-amp 4-w bus duct Lighting, Floors 4-10, West
1,600 amp 2,000-amp 4-w bus duct Lighting, Floors 11-20, West
800 amp 2-500 Mcm/phase Elevators, Low Rise
120/208-v Service - 2-3,000-amp, 4-wire bus duct
6,000 amp

ONE-LINE DIAGRAMS demonstrate reduction in switchboard equipment and numbers of feeders accomplished by using 277/480-v system in this building. Not only is the number of feeders reduced, but there is a saving in conductor size and rating of feeder breakers

The 20-story building will be 122 by 253 ft and will have a floor area of 563,000 sq ft. It was designed by Kenneth Franzheim, architect, and Bernard Johnson & Associates, engineers. Ownership is joint between Texas National Bank and Continental Oil Co.

Electrical Load . . . Connected electrical loads found in the buildings are shown in Table II. They total nearly 6,700 kva. Almost half of the load is lighting and an additional third is air conditioning. Estimated demand is 3,600 kva. Based on the gross area of 563,000 sq ft in the building, this gives an electrical load of 6.2 volt amperes per sq ft.

Service to the building consists of two separate bus services into the building from separate transformer vaults. Each of these services is protected by a main breaker and distributes power to portions of the building through feeder breakers. Main breakers for 480 v are 4,000 amp on 4,000-amp, 4-wire bus duct services. For 208-v service they would have been 6,000 amp with two 3,000-amp on each 4-wire bus duct. The 600-hp compressors are served with 1,000-amp breakers and 1,000-amp bus duct; whereas they would have been served with 2,000-amp breakers and 2,000-amp bus duct on the 208-v system.

Loads Grouped at 480-V . . . For the 480-v system several loads were combined on one breaker; whereas they would have been served by separate feeder breakers or switches on the 208-v system. This included some lighting for the main portion of the building on the main switchboard, and combining several store and bank loads on one feeder on the store and bank switchboards. Ratings of all feeders and switches or feeder breakers were, in general, materially reduced on the 480-v system.

In addition to the lower current ratings of feeder breakers and feeders, electrical work in the office portions of the building changed considerably. The 20-amp breakers are usually loaded at 80% of breaker rating or 16 amp. On 277/480-v system, loads are confined to a maximum of approximately 4,300 w on each branch circuit. At 120/208-v, this maximum limitation drops to approximately 1,800 w per circuit.

With the advent of new 277-v, 20-amp switches, the number can be greatly reduced in general office areas. They are applied only to fluorescent lighting systems using 277-v equipment which are used throughout most of the building. But this results in panels with fewer branch circuit breakers and fewer wall switches. It is necessary also to provide the standard 120-v convenience outlet circuits for office machines on either system.

Tenants' Electricity to Be Metered . . . Circuits to the individual tenants are provided with facilities for metering when space leased is larger than approximately 2,500 sq ft. On this basis, many floors have facilities for metering 12

Table I—Contractor's Changes Show 480-v Savings

	Material	Labor	Total
Switchboards, bus duct, and panels	$69,583	$5,451	$75,034
Transformers, circuit breakers, and safety switches	−17,315	− 9,737	−27,052
Conduit and wireway	4,293	4,606	8,899
Wire	26,434	1,180	27,614
Locknuts and bushings	− 592	.....	− 592
Pull boxes	− 1,172	− 637	− 1,809
Hangers and cable supports	1,452	68	1,520
Lighting fixtures and lamps	−27,619	122	−27,741
Boxes and devices	1,066	1,600	2,666
Q and underfloor duct	− 315	− 114	− 429
Cold cathode lighting and misc	− 2,698	− 2,766	− 5,464
Telephone, clock, and Muzak	− 798	− 292	− 1,090
ADT, signal and misc	− 426	− 1,310	− 1,736
Total Net Savings	$51,893	−$2,073	$49,820

—Indicates excess cost of 480-v over 208-v system.

Table II—Connected Load

	Connected kva	% of Total
Air conditioning	1,940	29
Elevators	415	6
Pumps and misc motors	1,230	19
General lighting	2,960	44
Exit and emergency lighting	144	2
Total kva	6,689	100

Table III—Switching and Feeder Requirements Are Cut at 480-v

Breakers		Feeders		Switch And Fuse Type Switchboards	
208 Volts	480 Volts	208 Volts	480 Volts	208 Volts	480 Volts
2 6,000-amp	2 4,000-amp	2 6,000*	2 4,000*	1 800-amp	1 400-amp
3 2,000-amp	3 1,000-amp	3 2,000-amp*	3 1,000-amp*	5 400-amp	5 200-amp
1 1,600 & 1 1,200-amp	1 1,200-amp	1 2,000 & 1 1,600-amp*	1 1,600-amp*	7 200-amp	7 100-amp
3 1,500-amp	3 1,000-amp	2 1,500-amp* & 5 500-MCM	2 1,000-amp* & 500-MCM	1 400 & 1 200-amp	1 200-amp
1 1,600 & 1 1,200-amp	1 1,000-amp	1 2,000 & 1 1,600-amp*	1 1,600-amp*	1 200 & 1 100-amp	1 200-amp
1 800-amp	1 800-amp	3 500-MCM	3 400-MCM	2 200-amp	1 200-amp
1 1,200-amp	1 400-amp	4 500-MCM	3 500-MCM	1 200-amp	1 60-amp
1 800-amp	1 300-amp	2 500-MCM	1 500-MCM	2 100-amp	2 60-amp
2 400-amp switches	2 200-amp	4 500-MCM	2 500-MCM	2 100-amp	2 100-amp
				1 200-amp	Deleted

* Bus duct feeders.

Table IV—Motor Control Centers Smaller

Starters	208 v	480 v
Size 5	6	...
Size 4	1	6
Size 3	6	1
Size 2	3	6
Size 1	...	3
Breakers	**208 v**	**480 v**
600-amp	5	4

Table V—Higher Voltage Saves on Lighting Panels

Location	208 Volts		480 Volts	
	Panels	Circuits	Panels	Circuits
Sub-basement	2	66	2	66
Basement	2	72	4	80
1st floor	1	32	1	36
2nd floor	4	156	4	108
3rd floor	5	210	6	180
4th to 10th floors	80	1,576	87	1,406
11th to 20th floors	106	2,040	89	1,524
21st floor	5	132	5	126
Penthouse	3	66	5	72
Total	208	4,350	207	3,598

large-area tenants each with a separate lighting system. Overhead lighting is fluorescent at 277 v, but 120/208-v power and lighting panels require an individual 480-v to 208/120-v transformer for each tenant.

Detailed information about the changes made by using the 277/480-v system is given in Tables III, IV, and V. The owners found it to their advantage to include air conditioning in space leases.

Major Equipments . . . Suppliers lumped prices for switchboards, panels, bus duct, motor control, and some other equipments into one figure which was not suitable for further breakdown.

This equipment on the 208-v basis was quoted at $245,000. The corresponding equipment for the 480-v system was quoted at $170,000 effecting a $75,000 saving. This is the principal economy realized in the redesign of the system from 208 to 480 v.

Lighting Fixtures . . . Incandescent and fluorescent fixtures of the 208-v lighting system were, in general, reemployed for the 480-v lighting system in the same spaces. Most of the fluorescent fixtures were changed to 277-v equipment which cost somewhat more than the same fixtures at 120 v. The total cost of fixtures for the 480-v distribution system was $261,200. This represents an increase of approximately $27,700 over those for the 208-v building electrical system.

Conduit and Wire . . . Considerable saving was realized in conduit size and wire size by the change from 208 to 480-v. Portions of this change are indicated in Tables III and IV.

In addition, considerable saving was made in conduit and wire on tenant floors. This saving came about because more fixtures were used on each lighting circuit, resulting in fewer home runs. This tendency may be noted in Table V which shows a reduced number of lighting circuits for the 480-v system. Panels for the 11-20th floors, for example, have only 1,524 lighting circuits on the 480-v system; whereas 208 v would have required 2,040.

Lighting panels for lower floors show similar but less spectacular savings. The total cost of conduit and wire was $69,200 for the 480-v system, compared with the contractor's estimate of $104,830 for the 208-v system.

Devices, Boxes and Plates . . . Notable changes were made in the number of wiring devices, boxes and plates. The 480-v system required 980 wall switches; whereas the 208-v system would have had 1,290. Convenience outlets on the two systems were the same, but the number of wiring device boxes was reduced considerably. The contractor's estimate for the devices, boxes, and plates was $11,000 for the 480-v system, a saving of $2,600.

Transformers . . . The 208-v system did not employ transformers in any way. However the 480-v system requires transformation of miscellaneous power to 120/208 v for convenience outlets and such incandescent lighting circuits as were required. The average number of transformers would be approximately four per floor. But some floors need just two transformers while others have ten. The contractor's estimate for these transformers was $27,000 which was an additional expense for the 480-v system for equipment of a type not required on the 208-v electrical system.

Cost Savings . . . The reduction in cost of the work was mainly realized in the main switchboard, feeder bus ducts, and motor control center. Addition of transformers for each tenant in the office areas boosted the cost of electrical work in these areas slightly. Overall savings in the electrical work amounted to some $49,820 in a contract of $1,051,000, a reduction of 5% in the total electrical cost. Additional savings of $4,844 were realized in the air conditioning contract because of the lower cost of 480-v control equipment for 600-hp refrigeration machines. Total gross credit was $54,664 for the 480-v system.

Gross savings were reduced somewhat because of increased space required at some locations for additional transformer installations. Net savings to the building by the use of the 277/480-v distribution system were $52,153. On the basis of the expected 3,600-kva demand this is $14.50 per kva.

Fixture Cost Limits Savings . . . A major factor was the increased cost of the fixtures for the 277/480-v system. This was apparently due to an increase in price of $1.40 for the fluorescent lamp ballasts at this higher voltage. There are two ballasts per fixture, 10,000 fixtures included in the job. This gives the increase of approximately $28,000 shown in Table I. This cost revision was made about a year and a half ago and based on prices presumably in effect at that time. If it were made today and these fixtures were ordered in this quantity, no appreciable difference would be expected for the higher voltage fixtures. If the fixtures had cost the same, savings would have been increased to a possible $80,000 or $21.60 per kva.

480-V System Includes Additions . . . Plans for the 480-v system incorporated electrical additions necessitated by architectural changes and additions during the three-month period required to design the 480-v system. Very roughly these added $10,000 to the electrical contract. Information is not available to determine accurately this additional cost.

The costs in Table I, as well as other tables, include these changes and additions. If this $10,000 were taken out, net possible savings would be nearer $87,600 or $24.30 per kva. This then would be the significant net difference between the two systems and would indicate a possible savings of about 8% of the total electrical cost.

Applicability . . . Many factors determine the applicability and the amount of savings of the 277/480-v system for a particular building or installation. The first and most important factor to be considered is whether 480-v service is available in the area. But perhaps the largest factor is the configuration of the building. The greatest saving can be made when the area per floor is small compared with the number of floors.

The ratio of 120-v to 480-v load is another important factor in the benefits that can be realized. This ratio on the Texas National Bank Building was 1 to 18 which means the 120-v load is 6% of the total. As the ratio increases and more 120-v transformer capacity is required, then savings favoring the 480-v system are decreased.

The main factors accounting for the savings in the 277/480 system here have been large general-area lighting loads and large central air conditioning systems. But savings from higher voltage distribution systems are not limited to office buildings. They may frequently be applied with success in schools, hospitals, and in modern shopping centers.

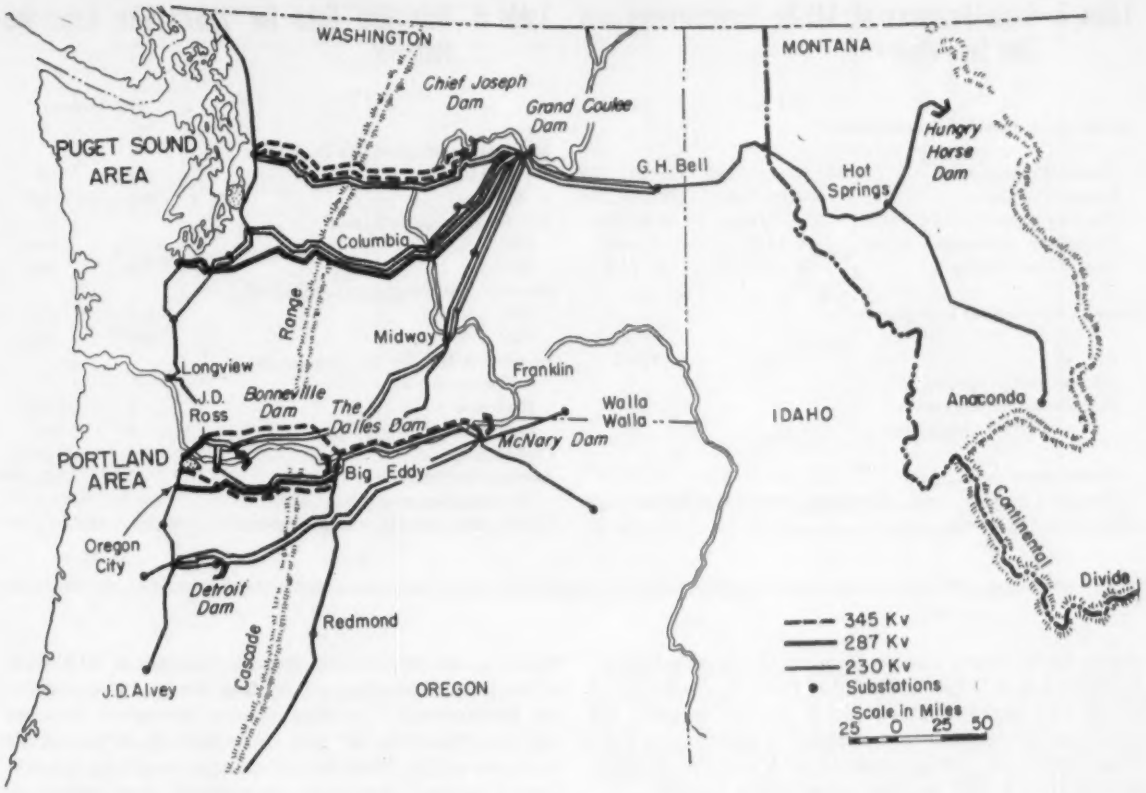


FIG. 1—EXTRA-HIGH VOLTAGE LINES, 345 kv and 287 kv, will be needed to carry power from 3.5 million kw of federal generation now under construction. Congested mountain passes in Cascade Range point up use of 345-kv lines over exclusive but enlarged 230-kv grid

With 3.5 million kw more hydro to be added in ten years . . .

BPA Picks 345 Kv to Double Capacity

Bonneville Power Administration is going to 345 kv for the transmission of large blocks of power long distances across rugged mountain terrain from new federal hydro plants to metropolitan load centers. Adoption of extra-high voltage was necessary because the capacity of BPA's transmission grid must be doubled within the next decade. During this period, the grid must carry power from about 3.5 million kw of federal generation now in operation or under construction.

Behind the adoption of 345 kv are studies over several years that brought out these basic considerations:

1. Extra-high voltage shows substantial savings in the cost of transmitting power as compared with an exclusive 230-kv grid. For the distances, circuits, and loadings involved, 345 kv is more economical than 287 or 400 kv.

2. Considerable savings may be achieved by using original 230-kv phase spacing and insulation, but with an increase in conductor size and operating levels to 287 kv.

3. Use of extra-high voltage reduces the number of circuits through a limited number of mountain passes.

4. Integration of the 345-kv and 287-kv lines into the existing 230-kv grid through autotransformers and 230-kv switchgear provides greater flexibility in operation and planning, and reduces the intial cost of equipment.

5. The conductor that meets economy and corona requirements at 345 kv is a 1,120-MCM copper-equivalent ACSR cable of 1.602-in. diameter.

6. Series capacitors will be added when 345-kv circuit loadings above 400-500 Mw become desireable.

Sources and Load Centers . . . Projected extra-high voltage circuits that will run from generating plants east of the Cascade Mountains to load centers around Portland and Seattle are shown in Fig 1. Two 345-kv circuits, each 133 miles long, are being built from Chief Joseph Dam to the Puget Sound area. They will be energized at 230 kv in 1955 and later raised to 345 kv as required by increases in capacity at Chief Joseph. Another 175-mile circuit now under construction between McNary Dam and J. D. Ross substation in the Portland area will operate at 345 kv in 1956.

Later a 110-mile, 345-kv circuit will be added between The Dalles Dam and the Portland area. One 240-mile

Table I—Basic Features of 345-Kv Transformers and Line Insulation

	287 Kv	345 Kv
Autotransformer characteristics*		
Nominal rating, kv	307/295–241/230	345–241/230
Capacity, Mva	80/106/133	120/160/200
Tertiary capacity (13.2 kv)	35% Min	35% Min
Impedance, maximum	4.12%	4.40%
Guaranteed efficiency	99.7%	99.76%
Line and terminal insulation		
BIL, kv	1,050	1,175
Bus and switch insulators**	6	7
Line insulators, tangent	16	19
deadended	18	21

* Single-phase units.

** Standard pedestal type. Overhead ground wire for one mile adjacent to the station.

Table II—Quotation Data for 230/345-kv Autotransformers

	Bid Group A	Bid Group B
Maximum continuous kv for BIL of:		
1175 kv	362	347
825 kv	254	242
BIL for nominal ratings of:		
345	1175	1300
230*	825	900
60-cycle Test for nominal ratings of:		
345	520	575
230*	360	395
Increase in BIL for 5% increase in Continuous kv		
High side	0	10½%
Low side	0	9%
Cost increase	0	15–17%
Average cost increase (Six transformers)	0	$360,000

* With ASA tolerances and additional + 5% tap (241.5 kv).

circuit from Grand Coulee Dam to Olympia, scheduled for operation at 287 kv in the fall of 1954, is now energized at 230 kv. Another 287-kv line is planned to cover the 120 miles between Big Eddy Substation and Oregon City. Other 230-kv circuits in the main BPA grid are designed for operation at 287 kv when economically justified.

When federal generation now underway in the Columbia River basin is completed, Bonneville will have about 550 miles of 345-kv circuits and 320 miles of 287-kv lines in operation. In addition, reliance still will be placed on 230-kv lines as additions to the main grid and as radial extensions to reinforce transmission to secondary load areas.

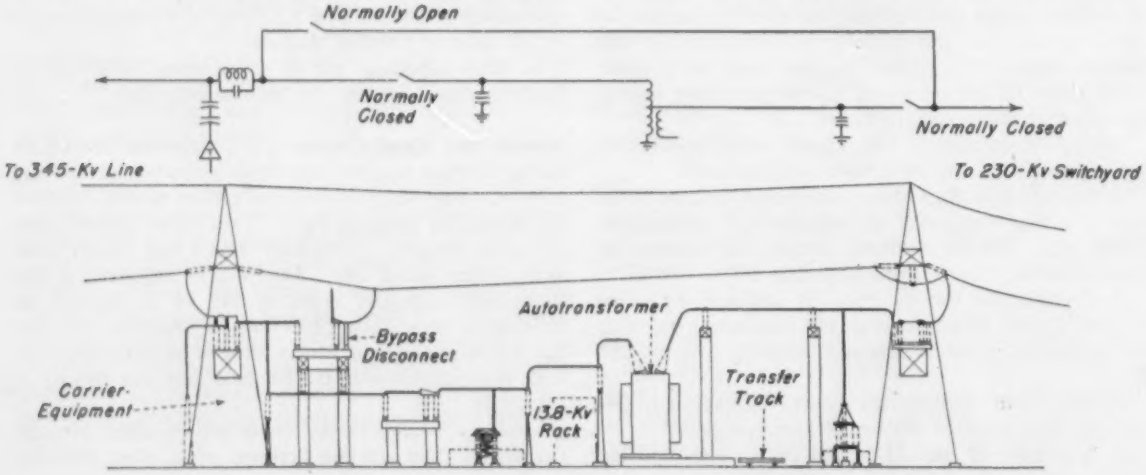
Switch on 230-Kv Side . . . All extra-high voltage circuits will operate at 230 kv initially. As additional generation is installed and more transmission capacity is required, identical autotransformers will be installed at both ends of the lines. Switching will be done on the 230-kv side of the transformers. Isolating by-pass disconnect switches will be provided for each autotransformer to permit operation at 230 kv if desired or necessitated by a transformer failure. Switching arrangement and substation layout is illustrated in Fig 2.

Characteristics of autotransformers and insulation for operation at 345 kv and 287 kv are listed in Table I. Cost of basic insulation levels for the adoption of an operating voltage was evaluated on the basis of these alternates for six 230/345-kv units:

1. Maximum continuous operating voltages permissible for windings having BIL's of 825 and 1,175 kv, respectively:

2. BIL's to which transformers could be tested for nominal voltage ratings of 230 kv, with a 241.5-kv tap, and

FIG 2—AUTOTRANSFORMER SWITCHING will be performed on the 230-kv side, a practice which eliminates need for 345-kv circuit breakers. In this arrangement each transformer will be equipped with a 230-kv tap, thus matching the voltage which is applied at sending end



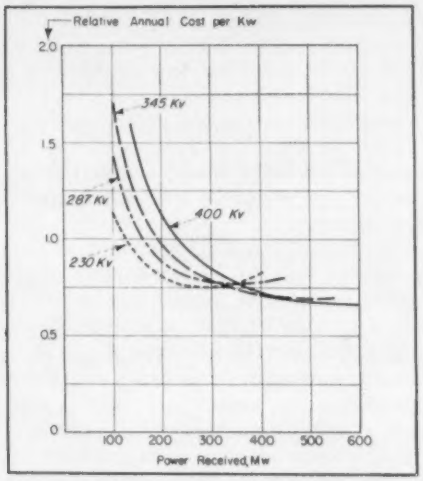


FIG 3—FOR 100 MILES, general studies show the economics of extra-high voltage. Charges cover losses, equipment, and operating costs

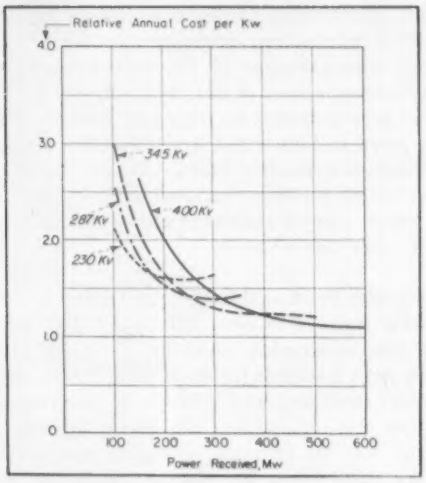


FIG 4—FOR 200 MILES, economics of extra-high voltage favor loads 250 Mw and above. For loads above 410 Mw savings are insignificant

345 kv in conformity with ASA standards for taps and tolerances. Comparative data are included in Table II.

No Spare Transformers . . . Insulation levels for the transformers selected, including bushings, will be 1,175 kv at the 345-kv terminals, 825 kv at 230-kv terminals, and 110 kv at the neutral. Units will have a 13.2-kv tertiary of a minimum size for harmonic suppression. A full-load tap of 241.5 kv will permit matching the units with the operating voltage at the sending end. Benefits of impedance lower than 4.4% were found to be marginal for anticipated system loadings. No spare transformers are contemplated because in the event of failure transformers can be by-passed and the line operated at 230 kv at reduced capacity.

The 345- and 230-kv terminal equipment will be protected with 265 and 182-kv lightning arresters, respectively, corresponding to about the 75% level. By extrapolation, the 5,000-amp average protective level for 265-kv station type arresters is about 880 kv and the 20,000-amp level about 1,025 kv. With 1,025 kv as the 5,000-amp protective level for maximum expected surges and arrester tolerance, a margin of about 15% is provided by 1,175-kv BIL.

Use of the lower BIL and the 75% level may involve a slightly greater risk of arrester failure. Replacement of one faulted arrester pole would cost about $5,000 at present prices, to which must be added losses due to service interruption. However, lessening the possibility of arrester failure with 80% arresters would require $180,000 per bank of three transformers to cover the higher BIL.

Use Standard, Single Conductors . . . Radio-interference studies indicated that voltages up to 345 kv could make use of single standard ACSR conductors. Expanded or multiple conductors would probably be preferred for higher voltages. Difficulties in preventing ice formation on bundle conductors, as well as associated mechanical problems, preclude the use of multiple conductors now.

Selected for 345-kv operation is an ACSR conductor having an outside diameter of 1.602 in., 1,120-MCM copper equivalent, and 53,000-lb ultimate strength. Maximum working stress will be 19,000 lb. Conductor will be suspended from 5¾x10-in., 25,000-lb insulators with grading rings at the line end. Conductor separation for single-circuit towers will be 32 2/3 ft. This was determined by obtaining a clearance of 7.25 ft at 45 deg swing, as specified by the NESC.

Vertical separation on double-circuit towers will be 26 ft. Counterpoise may be added to towers within overhead ground wire areas (one mile from station) and to double-circuit towers in lightning areas to reduce tower footing resistance to less than 10 ohm. Experience at 230 kv will show the desirability of counterpoise.

System stability was a major factor in designing the extra-high voltage lines. Studies indicated the Bonneville grid could stand the sustained loss of two 230-kv circuits, or equivalent capacity, to any one major load area. Further, the system could take the momentary outage of an additional circuit without undue hardship on the region (Northwest Power Pool). From these analyses it was decided that steel towers not designed to support ground wires could be used for voltages above 230 kv. (See "Full-Scale Tests Prove BPA's 345-Kv Tower Designs, EW, Feb. 8, p 82). Following accepted 230-kv design, double-circuit tower construction will be used wherever it is more economical than parallel single-circuit lines.

Tower Design Conditions . . . With the exceptions noted, single- and double-circuit towers are designed to these conditions: All conductors intact; outside conductor broken (one upper conductor for twin-circuit); center conductor broken (one middle for twin-circuit); double vertical load on crossarms; pull of 15,000 lb per conductor; and transverse 8-lb wind load, ½ in. of ice on conductor, plus wind load of 13 psi on 1.5 times the projected area of one tower face. Tower members are all ordinary grade structural steel except for some members of high-elastic-

limit steel. The average single-circuit tower weighs 19,861 lb complete, the average double-circuit tower 33,680 lb.

Physical characteristics of the new 345-kv lines are based on general studies of 287, 345, and 400 kv. Results of typical general studies for 100- and 200-mile transmission are given in Figs 3 and 4 respectively. Charges include power and reactive losses and all operating and equipment costs between the sending and receiving end 230-kv buses. Use of autotransformers and switching on the 230-kv side was assumed.

Specific Studies Point to 345 Kv . . . In Fig 3, note that when power received exceeds 320 Mw, 345-kv operation becomes most economical. And in Fig 4, 345-kv transmission is most favorable for loads from 250 to 410 Mw. Futhermore, compared with 400 kv, initial investment is considerably less for 345 kv. For higher loadings, transmission at 400 kv provides minimum cost. However, savings for transmitting 500 Mw at 400 kv are not significent. Specific studies show that the minimum cost point for 345-kv transmission could be maintained up to 600 Mw by the addition of series capacitors.

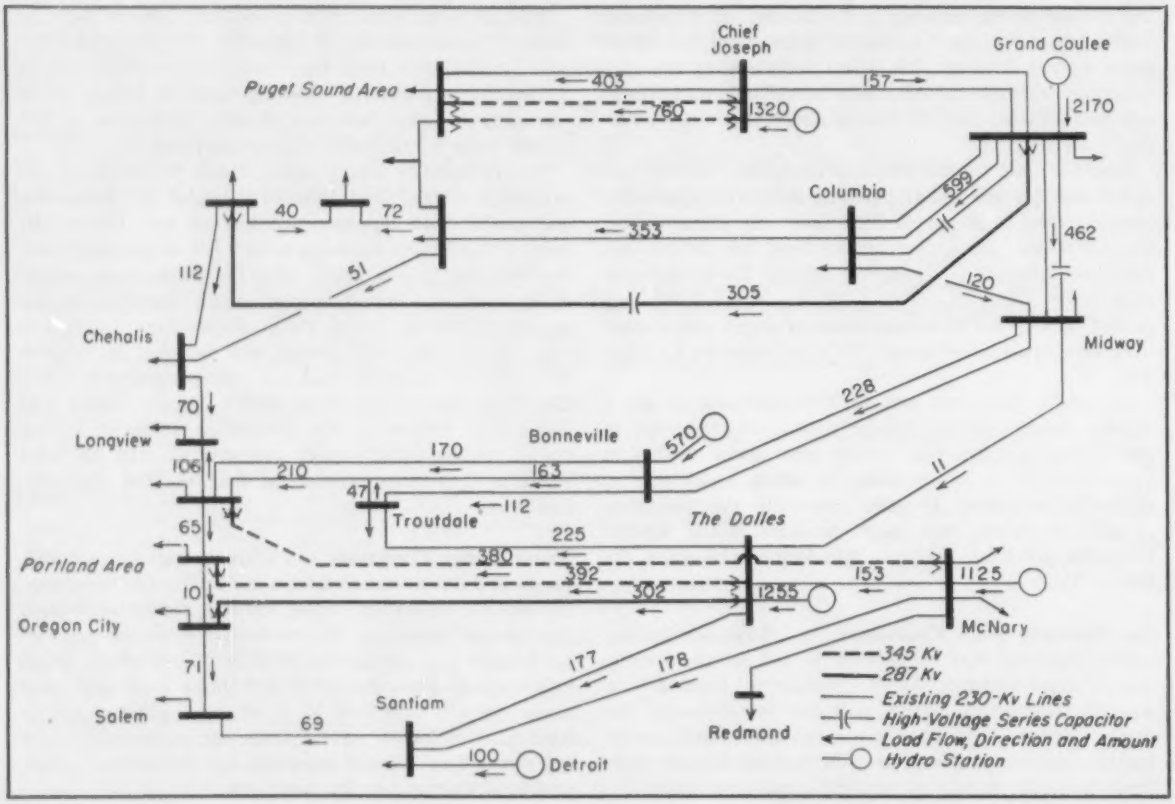
Consideration of all factors affecting successful use of extra-high voltage lines within the existing system led to the selection of 345 kv as the operating voltage. Some of these factors are: Initial normal loading for system reliability is 400 Mva per circuit; as the transmission grid grows, circuit loadings for 345 kv are expected to rise to as much as 500 Mw. This is about the maximum loading possible without a sacrifice of reliability.

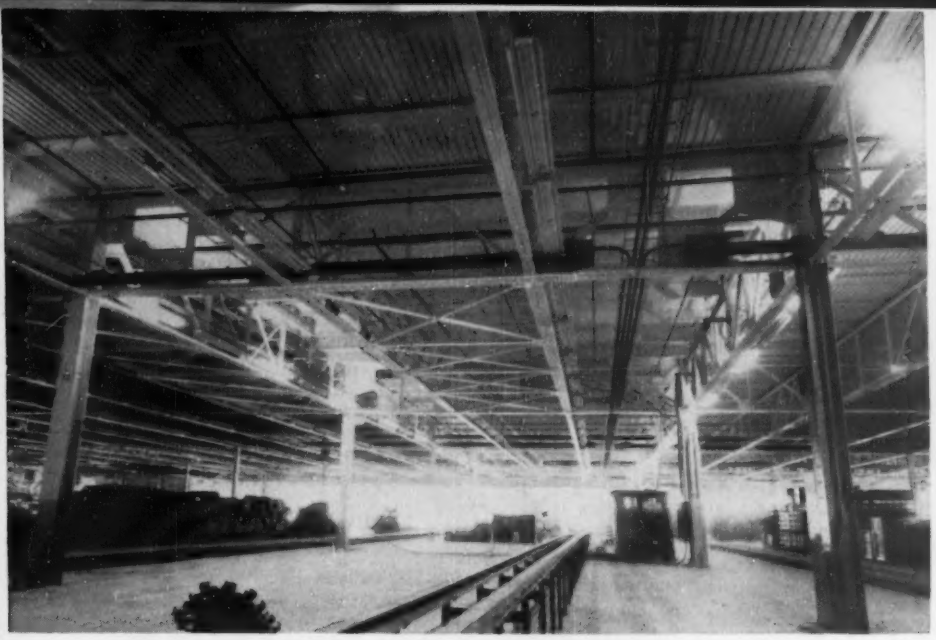
In selecting the 1.602-in. ACSR single conductor for 345-kv operation, these factors were most important: Magnitude of ice prevention loading, level of tolerable radio noise interference voltages, and economic balance between power losses and investment costs.

Ice Prevention and Radio Noise . . . Bonneville's operating experience has established relative benchmarks of ice prevention loadings. It was decided that loadings of sufficient magnitude could be guaranteed on extra-high voltage circuits. Thus, special ice-melting equipment or expanded conductor is not needed. Regarding radio noise, Bonneville has set an interference level of 15μ per meter at 200 ft from the conductor as average during fair weather. The conductor required to obtain such a level will normally have negligible corona losses.

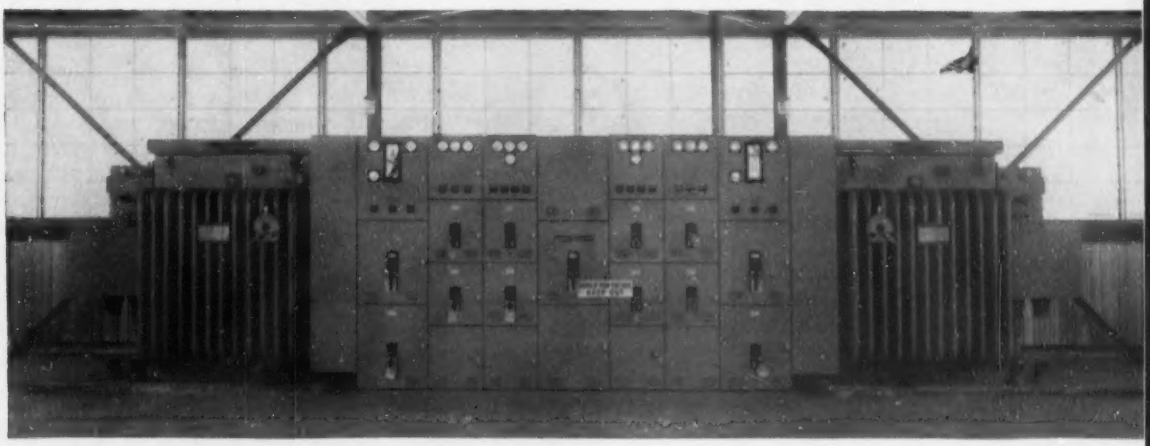
Prior to adopting extra-high voltage, methods of integrating such lines into the existing 230-kv grid were studied. One method in effect, would be a separate extra-high voltage system connected to the existing 230-kv system only where necessary to meet load requirements. But it was ruled out by these advantages favoring the adopted method: Greater flexibility in planning and operation. Extra-high voltage lines may be operated at 230 kv until load increases warrant the cost of the autotransformer. In event of transformer failure the line can be operated at 230 kv; costly extra-high voltage switchgear can be eliminated; a superimposed 345-kv grid may be established later through interconnection of 345-kv lines, should system expansion require it.

FIG 5—LOAD FLOWS on the BPA grid will double by 1964 over present loads. Studies show the grid will stand the loss of two 230-kw circuits, or equivalent, to any one major load center. Furthermore, it can stand momentary outage of one more circuit without undue strain





Plug-in, 480-V Duct Bus, Substations



On Roof Give Auto Plant Flexibility

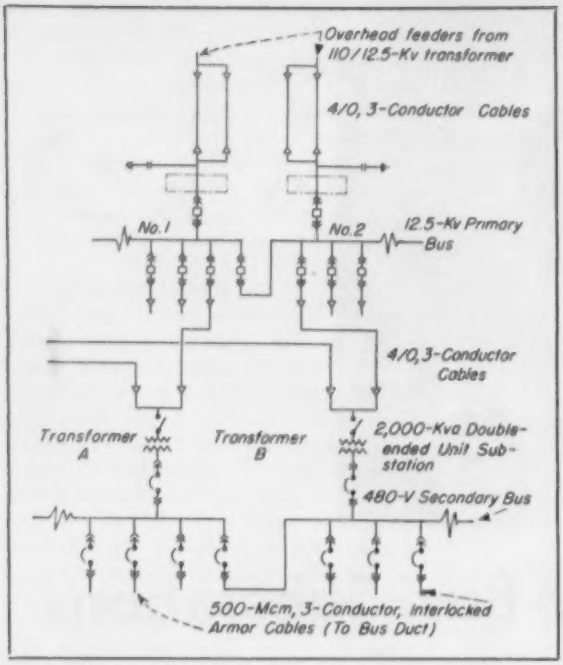
E. ERIKSRUD, Supervisor, Electrical Enginering Section, Plant Engineering Office, Ford Motor Co, Detroit, Mich.

NELSON A. KIEB, Electrical Engineer, Albert Kahn Associated Architects and Engineers, Inc., Detroit, Mich.

Photos furnished by George H. Miehls, structural engineer, and Albert Kahn Associated Architects and Engineers.

A selective radial secondary distribution system will provide the extreme flexibility needed to serve about 11,000 kva in electrical loads that are expected to shift location continually within the new Ford Motor Co assembly plant, Milpitas, Calif. Backbone of the system is an aluminum-conductor, 480-v plug-in duct system backed up by a 12.5-kv double-bus primary and eight roof-mounted substations. To provide general illumination for changing work areas and assembly lines, fluorescent lighting and trolley duct are being used.

Building Covers 30 Acres . . . Key building of the plant is the main assembly building, an 800x1,700-ft steel-supported structure covering over 30 acres. Building columns spaced



45x50 ft support 6-ft trusses that run in both directions. Two intermediate trusses in each bay are spaced 15 ft on center and run across the building.

It was decided that all loads in the assembly section, except welding, would be served best by eight 2,000-kva roof substations. Each substation room measures 45x50 ft and has a hatch for handling equipment. Initial electrical equipment does not occupy all the space in any one substation room. It is more economical to provide the space initially and have it available for instant use later.

Each substation provides for an area about 400x425 ft, or about 12 va/sq ft. This is slightly above average for assembly buildings but allows for flexibility in plant rearrangement and for considerable growth. Air compressor and pumping load of the utility building was put at 3,000 kva. Capacity for a welding substation in the assembly building was estimated at 2,000 kva.

Twice Demand for Flexibility . . . Overall plant demand will be about 11,000 kva. To give the desired flexibility and reserve capacity, 21,000 kva of transformer capacity is installed. The plant is supplied by two overhead feeders from one 110/12.5-kv transformer in a Pacific Gas & Electric Co substation adjacent to the property. For the future a second transformer fed from a second source can be added for load growth or standby.

With power possible from two sources in the future, a double-bus primary system was selected. Two full-capacity 12.5-kv underground feeders run from the power company poles to the primary room in the utility building. Primary switchgear is 15-kv, dead-front, metal-clad draw-out type, with air circuit breakers of 500,000-kva interrupting capacity in main, tie, and feeder positions. The single row of switchgear has incoming and meter cubicles, main and tie-breakers in the center, and feeder breakers on either end. There are 21 cubicles, including two spares and a spare breaker, with space available on either end for another position.

Roof substations are in-line double-ended. In addition to secondary feeder breakers for known loads, six spare positions (three per bus) are provided in each substation. Each transformer has a metal-enclosed Askarel-filled disconnect switch on the primary side, and a main breaker on the secondary. The disconnect switch is key-interlocked with the secondary breaker to prevent operation except under no-load conditions. With two potheads on each primary switch, connected by bus within the cubicle, the primary feeder loops through the substation and continues to the next.

Air-Filled Box Guards Pothead and Cable . . . One interesting feature is the pothead connection to the Askarel-filled switch. In all Ford substations, an air-filled and well-drained metal enclosure is required between the potheads and the underside of the switch, so that leaking Askarel can be detected before it can damage pothead make-up or cable. Substation secondary switchgear is identical with two exceptions. To serve one very lightly loaded area, half of a 2,000-kva substation is used. The other 1,000-kva transformer is located in and serves the administration building. A 400-amp tie cable provides partial standby capacity to the halves of this first substation. The second substation serves only the welding load and has a few large breakers instead of many small ones.

Transformer A in each assembly building substation is fed from primary bus No. 1, with Transformer B fed from bus No. 2. Each primary feeder consists of a 4/0, 3-conductor, paper-and-lead cable with a Neoprene jacket and serves the transformer in two adjacent substations. For normal operation, the secondary tie breaker is open, with main and tie breakers key-interlocked to prevent making the tie until one main is open. With this scheme, a transformer or primary feeder failure involves only a temporary outage for one-half the load . Each main and feeder breaker has an ammeter and test block for load indication and for use of portable recording meters.

Bus Duct Has Aluminum Conductors . . . In the assembly building most utility motors, scattered production loads, and concentrated conveyor loads up to 100 hp are served by a 480-v, 400-amp, bus-duct system using aluminum conductors. The bus duct runs lengthwise of the building. Plug-in switches for conventional copper bus duct fit the aluminum duct without alteration.

The aluminum bars were zinc washed, heavily copper plated, then silver washed to provide an appearance and contact wear equal to that of copper. Material costs are about 8% less than for copper bus duct, and installation costs run slightly less because of lighter weight.

Duct runs are on alternate trusses to give an effective spacing of 100 ft between runs. Bus ducts are broken at the center and at the extremities of each area fed by one roof substation. Feeders run perpendicular to and connect to the inner ends of the duct. Eight breakers per substation feed the bus duct, with four breakers on each transformer bus.

Secondary feeders to the bus duct are 500-MCM, 3-conductor, varnished-cambric and interlocked-armor cable run in ladder-like aluminum racks through the trusses . Eight cables, grouped at the substation, run together, one pair feeding each plug-in duct.

Welding Load May Move . . . The welding load is fairly well concentrated at present. But there is a good possibility that it may be shifted or expanded to another area. One welding substation in the roof substation room nearest the load has three 1,200-amp, low-reactance ducts that run out through the trusses over the load. Cable tap boxes on 20-ft centers along each run facilitate connections to welders. The 1,000-kva transformers in the welder substation are fed from the primary feeders that supply the utility building substation. There are spare underground ducts between the present and proposed welder substations.

Remaining principal load includes four 400-hp air compressors and package boilers in the utility building. Serving this load is a 3,000-kva, double-ended substation of the same general design as the other substations. It is located with the primary switchgear in a room separated from the rest of the building. Electrically operated breakers for the compressors are actuated from control stations on field application cubicles adjacent to the compressors.

Maintained Intensity 30 Ft-c . . . The assembly building is illuminated by two-tube, 8-ft, Slimline fluorescent industrial fixtures with slotted porcelain enamel reflectors and 4,500 deg tubes. Fixtures hang on 10-ft centers from, and are supplied by, 50-amp trolley duct suspended from the east-to-west trusses. Each fixture contains a Fusestat within the wiring channel. Maintained intensity will be 30 ft-c.

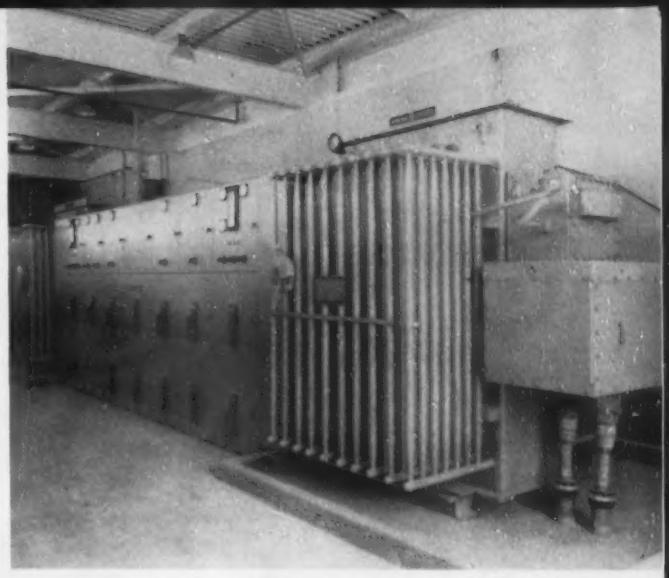
Trolley duct is fed at 120 v through narrow column-type lighting panels. There are 50-amp, single-pole breakers for general lighting and similar 20-amp breakers for receptacle and spare circuits . A dry-type transformer mounted above each panel in the truss is fed from the 480-v duct system. General lighting will be supplemented by additional fixtures along conveyor lines to obtain desired intensities.

Load in the administration building consists of lighting, air conditioning, ventilating, and main kitchen. Lighting will consist of ceiling-mounted, louvered commercial-type fluorescent fixtures. They will be individually mounted in rows 4-ft apart crossing the building and centered on the 4-ft sash. Maintained intensity will be 35 ft-c minimum.

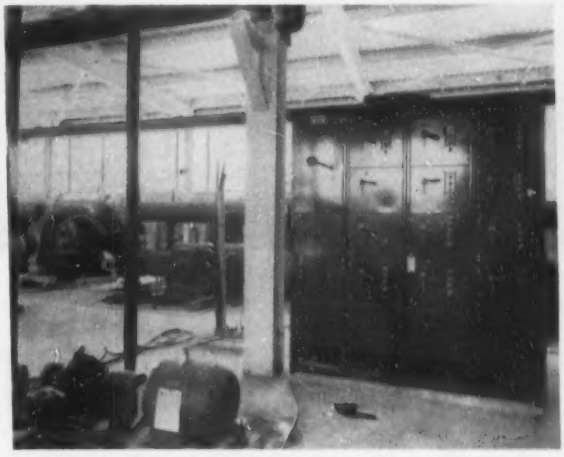
Kitchens and cafeterias will be lighted by two-tube, 8-ft, Slimline fluorescent fixtures without reflectors mounted on the ceiling. Intensities will range from 20 ft-c in the cafeterias to 40 ft-c in the kitchens and work areas. The tubes will be deluxe warm white. Small offices in the assembly building are lighted to 35 ft-c by two-tube, 40-w, bi-pin fluorescent industrial fixtures with slotted reflectors.

Exterior Lighting . . . Building exterior perimeter lighting will be provided by 500-w, enclosed floodlights on about 80-ft centers. Parking and convoy lot lighting will consist of 1,500-w, enclosed floodlights on 40-ft steel poles. Buried 480-v wiring will feed transformers on the poles that step down the voltage to 120 v.

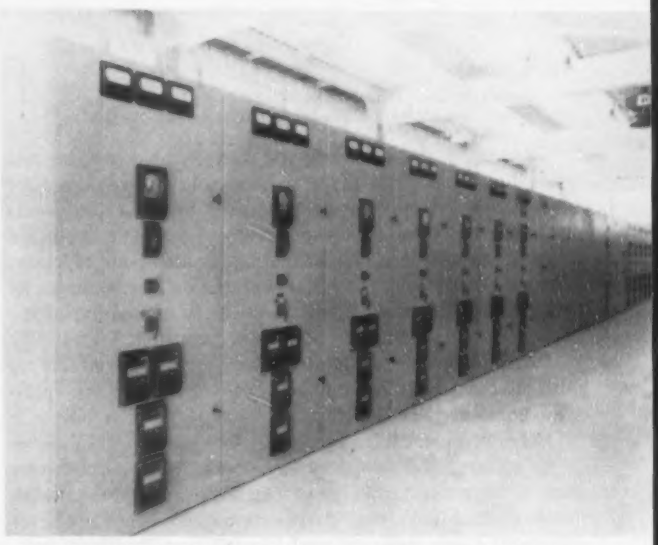
Road and bus loading lighting in front of the administration building will consist of asymmetric-refractor-type fixtures using 300-w, multiple lamps on 26-ft ornamental steel poles spaced 75-100 ft on centers. Distribution is at 120/208-v, 3-phase, 4-wire, because of the small number of units. The Milpitas assembly plant and its electrical facilities were designed by George Miehls, structural engineer, under the direction of Ford's plant engineering office, with Albert Kahn Associated Architects and Engineers, Inc, as consultants. They were engaged by the plant engineering office early in 1953.



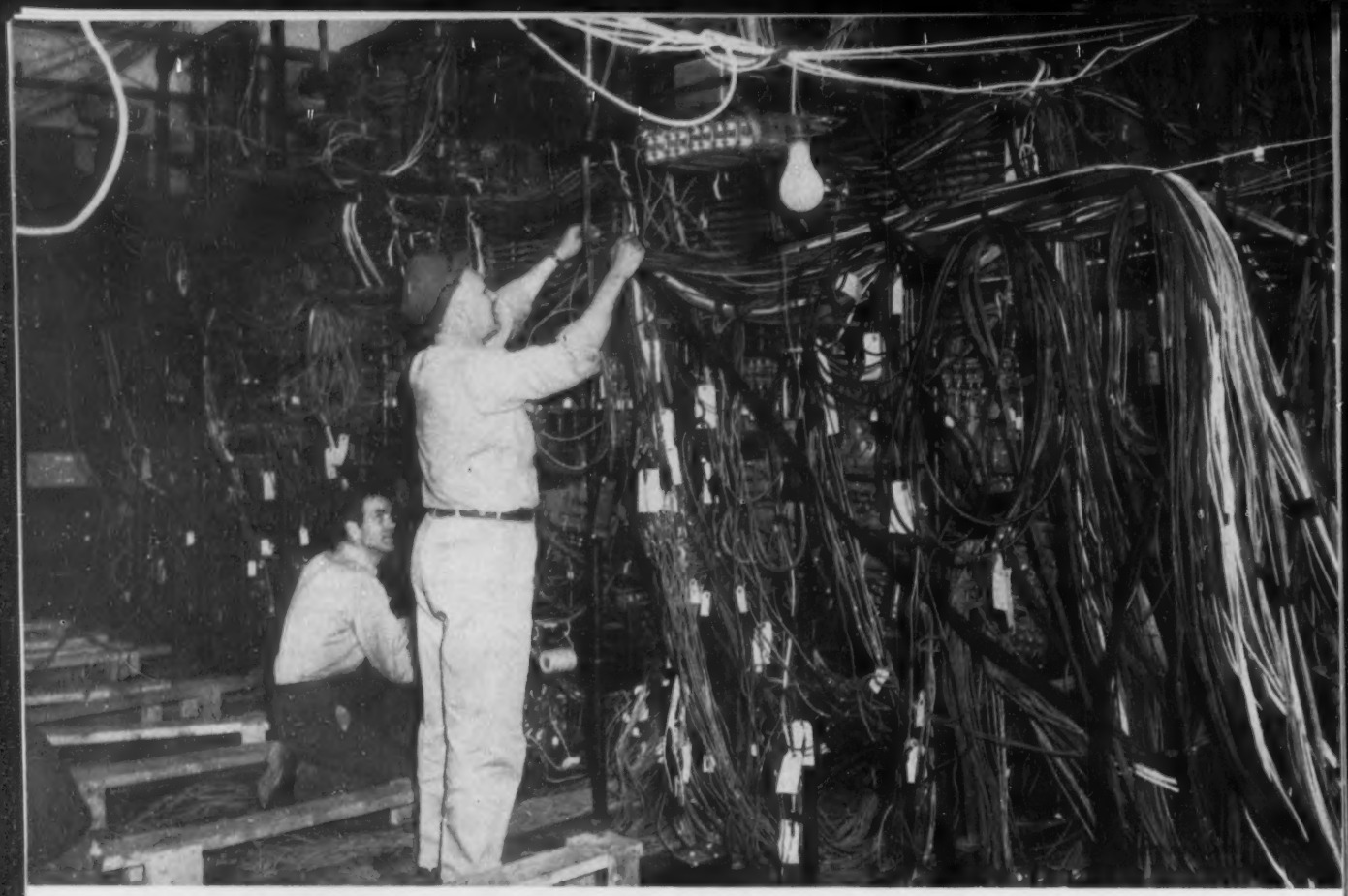
WELL DRAINED METAL ENCLOSURE separates the pothead and cable from Askarel-filled switch as protection against leakage



CONTROL OF FANS on the utility building roof is provided by the load centers, each center having its feeder and substation breaker



PRIMARY SWITCHGEAR is dead-front, draw-out type, 15-kv air circuit breakers. Two spare cubicles and spare breaker are included



MULTI-CONDUCTOR CONTROL CABLE

What kind do you use and how do you install it?

D. L. GREENE,
Assistant Chief Electrical Engineer,
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Present day multi-conductor control cable practice and installation methods of 22 eastern utility companies have been revealed by a survey conducted by the Pennsylvania Electric Association. The survey did not recommend types of control cable, insulation or make-up of same, and it did not discuss the advantages or disadvantages of installation practice. It was, however, a summation of the present day practice of 22 utility companies.

A fictious cable, which would be closest to the preference of all the reporting companies, would follow the specifications given at the right.

The fictious cable, however, does not give an accurate account of the different cable used. No two companies used the exact same type. The following tables, which are divided into two parts, namely: "Multi-Conductor Control Cable Practice" and "Installation Practice", indicate this wide preference.

Cable Component	Most Frequently Used
Conductor	
Number	2, 3, 4, 5, 7, 9, or 12
Size	No. 9
Stranding	19/No. 22
Coating	Alloy (lead)
Insulation	
Kind	Ozone-resistant (oil base) compound
Thickness	3/64 in.
Covering	Neoprene
Coding	IPCEA color
Outer Covering	
Filler and tape	No filler (binder tape only)
Metal tape	None
Jacket	Neoprene (extra 1/64 in. for direct burial)

Multi-Conductor Control Cable Practice

A complete tabulation of all the different components of a present day multi-conductor control cable follows. Tables give information on both the jacket and insulation.

Number of Conductors in Complete Cable

Conductors	Users	Conductors	Users
2	16	12	10
3	10	13	2
4	13	14	1
5	9	15	3
6	6	16	2
7	12	19	5
8	6	24	1
9	11	27	1
10	6	37[1]	3
11	1	61[1]	1

[1] One company uses 37 and 61 conductors. Each conductor consists of No. 16 solid with cotton braid. In one case a Neoprene jacket with a lead outer covering is used for special conditions. In another case an asbestos-Neoprene jacket is used. This jacket is covered with asbestos braid. The braid is impregnated with sodium silicate and fillers. This jacket provides a flame-resisting finish.

Size of Conductor

Size	Users	Size	Users
No. 6[1]	1	No. 10	6
No. 7	1	No. 12	8
No. 8	2	No. 14	3
No. 9	17	No. 16	1

[1] One company uses No. 6 on long current transformer runs where low burden is necessary.

Stranding of Conductors

Type	Users
Solid	4
Standard stranding	11
19 strands	20

Coating of Conductors

Kind	Users
Tinned	10
Lead, lead-alloy, or alloy	13
None	4

Insulation of Conductors

Grade	Users
Code	0
Performance	5
Heat-resisting	7
Ozone-resistant (oil base) compound	19
PVC	8
Polyethylene	2
Varnished cambric	1
Asbestos	2
Unclassified	4

Thickness of Insulation

Wall thickness	Users
3/64 in.	21
4/64 in.	8
5/64 in.	4[1]
6/64 in.	1[2]

[1] Used on No. 8 in two cases. [2] Used on No. 7 conductor.

Covering of Conductor

Material	Users
Neoprene[1]	16
Flame-resistant braid[2]	4
Cotton braid	3
Rayon braid	1
Tape (used under lead jacket)	1
None[3]	7

[1] Practically all companies use $\frac{1}{64}$-in. Neoprene except on the large conductors.

[2] The flame-resistant cotton braids reported were assumed to be those referred to in IPCEA as braids saturated with flame-retarding compounds.

[3] Covering is omitted on all different kinds of insulation.

Coding of Conductor

Kind	Users
Standard IPCEA color	19
Special color	2
Printed color	1
Printed numbers	2
None	4

It is interesting to note that while this report shows a large number of companies use colored conductors, manufacturers indicate a trend toward plain conductors.

Fillers and Tapes over Cabled Conductors

Material	Users
Rubber filler	3
Jute Filler	3
Tapes (various kinds)[1]	13
None (11 no report—assume none)	16

[1] Several kinds of tape were reported:

2—Asbestos-Neoprene	1—Neoprene filled
1—Rubber	2—Fiberglass and glass braid
1—Cotton	1—PVC filled
1—PVC tape or equivalent	4—Tape (no description—assume simple binder)

Metal Tape under Jacket

Material	Users
None	27
5 mil commercial bronze	1
10 mil bronze	1
5 mil copper	1
5 mil zinc (under Neoprene)	1
3 mil tinned copper, 25% lap[1]	1

[1] Applied on direct burial under Neoprene for termite protection.

Manufacturers also report that metal tape is not generally used. However, in recent months there has been a trend toward the use of metal tape on underground cables. This tape is used to protect against microorganisms, rodents, and termites.

Jacket Outer Covering

Material	Users
Neoprene[1]	20
Flame-proof asbestos braid[2]	7
Lead[3]	6
PVC (generally used over PVC insulated conductors)	4
Braid	1
Glass (special use)	1
Steel armor[4]	2
Neoprene over lead (special conditions)	1
Asbestos sleeves (used in floor trenches)	1

[1] Most Neoprene jackets are of standard thickness, however a few have extra thick walls.
[2] Reported as follows:
1—Single asbestos braid with a smooth gray oil paint flame-proof finish.
1—Overall asbestos braid impregnated with sodium silicate and fillers providing flame-resisting finish.
5—Slight variations of asbestos braid.
[3] Reported as follows:
2—Lead used underground only.
2—Lead used on certain cables.
1—Lead used on many small conductors with special make-up.
[4] One company reports galvanized steel interlocked armor with waterproof jute covering. This was used on long cable runs.

The predominant jacket used for direct burial and for use in open trenches is Neoprene with 1/64 in. extra wall thickness . Manufacturers report anywhere from 50% to 90% of their production has Neoprene jackets.

Installation Practice

These tables give information for both above and below ground installation methods. The types of material that are used are also enumerated.

Tray Material and Construction (indoor)

Type and Material	Users
Expanded galvanized metal[1]	12
Sheet steel (12 and 14 gauge)	7
Angles with sheet-mesh-expanded metal	3
Transite	2
None	1

[1] Majority report galvanized. It is assumed all are.

Tray Covers

Material	Users
None	12
Steel[1]	10

[1] The majority of companies reported the use of covers for locations under piping, grating, stairways, etc. One uses a sloping steel cover in these places and around the turbine-generator.

Trench in Floor (indoor)

Construction	Users
None	16
Concrete with steel covers[1]	6

[1] Construction of one trench used creosoted plank sides and top. Another used steel duct with cover.

Cables are in general laid loosely, however racks and trays are used by some companies if the concentration of cable is heavy.

Duct Banks (outdoor)

Material	Envelope	Users
Galvanized steel conduit[1]	Note 2	11
Black enamel steel conduit	Note 2	2
Transite Conduit (heavy wall)	Concrete[3]	3
Transite Korduct (light wall)	Concrete[3]	7
Fiber Nocrete (heavy wall)	Concrete[3]	2
Fiber duct (light wall)	Concrete[3]	8
None		1

[1] Some painting of galvanized steel was reported for underground installations.
[2] A concrete envelope was provided in most cases, especially under roadways and in other locations where required because of local conditions.
[3] Heavy wall Transite and fiber were used without envelopes in most cases.

Trench—Open with Cover (outdoor)

Construction	Users
Cinder block or precast concrete sides, crushed stone bottom, precast concrete top, cables in Transite trays	1
Creosoted yellow pine sides and top. Cables laid in sand at bottom of trough	1
Concrete walls with covers of steel, or 3/16-in. aluminum, or 5/8-in. asbestos board and concrete top with manhole covers	3
Not used	17

Direct Burial (outdoor)

Method	Users
Buried in bed of ¼-in. washed pea gravel backfill with stone-free earth	1
Buried in sand. Covered with (3) creosoted plank; (1) 1-in. to 2-in. weak concrete; (4) no cover	8
Not used	13

Tunnel

Construction	Users
Concrete—2 with concrete cover; 1 with aluminum cover	3
Not used	19

One concrete tunnel is completely underground; the other two are above the ground, thus providing a walkway.

Manufacturers' Information . . . Information received from cable manufacturers did not in all instances agree with the findings of the survey.

For instance, one company finds a greater demand for No. 10 and No. 12 than for No. 9. This does not agree with the report which shows a predominant usage of No. 9. Another manufacturer shows almost as much oil-base compound used as all other types combined. However, one cable company uses 3/64-in. insulation for No. 10, No. 12, and No. 14. This substantiates the report. A few manufacturers report a trend away from color coding and the use of printed words and numbers instead. All companies also report very little metal tape used, but indicate a trend to its use particularly for direct burial cable. All companies also report increasing use of Neoprene as a jacket material. The use of lead has dropped considerably while the use of both Neoprene and PVC has increased.

Today's Station Designs— What's New?

Electrical World's third country-wide report covering 205 features of 65 new plants

Analysis of 205 check-charted details of 65 new power plants indicate that station designers are generally holding to established conventional practices. However, there is unmistakable evidence of increasing acceptance of new design and equipment ideas.

Some of the new ideas are:

1. ***Using high generator voltages.***
2. ***Resorting to cooling towers.***
3. ***Pressurization of combustion space.***
4. ***Putting condensers outdoors.***
5. ***Demineralization for feed water makeup.***
6. ***Forced (or controlled) circulation in steam generator.***

However, whenever conditions permit, station designers are holding to established conventional practices. Unit arrangement and outdoor design are now well-established features of today's power plants.

Other established practices to which power plant designers resort include:

1. ***Higher temperatures and pressures.***
2. ***Reheat cycle even in relatively low cost fuel areas.***
3. ***Functional arrangement of control boards.***
4. ***Grounding of generator neutral through a small distribution type transformer with secondary resistance.***
5. ***Earthmoving equipment for stock piling and reclaiming coal.***

A detailed analysis of steam station design practices is given in the following paragraphs and the accompanying fold-in check chart.

General Features . . .

Most of today's power plants have etiher one or two operating levels. Designers are using both the conventional and horizontal type of layout in building these plants. Neither type is favored over the other. Willingness to go "outdoors" has increased since the 1952 survey. The following table indicates the present status of this continuing trend:

Equipment Outdoors	No. of plants
Boiler	31
Turbine	19
Fans	43
Pumps	18
Air heaters	30
Dust collectors	31

Boilers are generally moving closer to the turbine, and pulverizers, when used, are alongside the boiler. Dual fans, air heaters, and dust collectors are generally the rule.

Quick load pickup is incorporated in the design of 20% of the reporting stations.

Building-wall construction is varied, undoubtedly to meet local circumstances. However as far as flooring is concerned, there is more uniformity—five out of six plants reporting the use of grating floors. Some plants have concrete or brick stacks, but 75% of them have steel stacks.

Fuel Handling . . .

Most coal-burning plants use earthmoving equipment for both fuel piling and reclaiming. The results of this survey indicate that there has been no substantial change since the 1952 survey in the other types of fuel handling and coal conveying equipment. There is no definite preference for ball or bowl type pulverizers; both were equally used. Most coal-burning plants have a bunker capacity for 30 to 50 hr of operation.

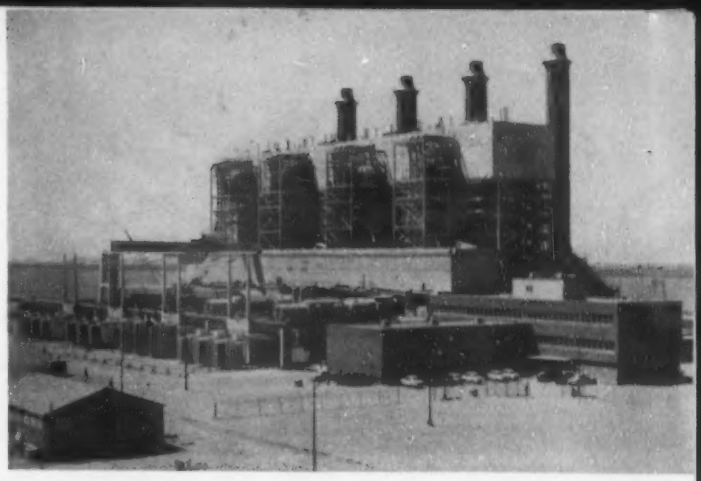
Steam Generators . . .

Temperatures and pressures are higher. Five out of six stations report steam pressures of 1,250 psi or above. One reports 2,400 psi, two report 2,350 psi, and 13 report 1,800 psi. Over half the stations report steam temperatures of 1,000F and above.

Another outstanding result of the survey is the fact that there is no sign of weakening in the acceptance of unit design. All stations report one boiler per turbine.

Three out of four plants have enclosed burner areas. Most of the plants having open burner areas are in the West South Central region. Fourteen of the 65 reporting plants, principally in the West South Central region, use pressurized boilers. Most plants use horizontal burners. The ratio is 8:4:1 for horizontal, tangential, and vertical burners respectively.

Various combinations of all the means listed on the check chart are used for superheat control. The most often used, in combination with other means, is the spray method (42 of 65 cases).



Reheat control is also accomplished by more than one means. The most often used methods, in combination with other methods, are spray control (24 of 35 cases) and burner tilt (17 of 35 cases).

Seven of the 18 cases of controlled circulation, reported as ordered in the previous survey, were accounted for in this survey. The rest of the plants use natural circulation.

Just about half of the stations report television facilities. This figure is an increase over the previous survey. The most often televised objects are the drum level guage and the burners. Some plants televise more than one object.

Ash Control and Disposal . . .

Plants having soot blowers use the retractable type with very few exceptions. Electrical dust collectors alone or in combination with mechanical collectors are equal in number to the straight mechanical dust collectors. Precipitator rectifiers, when used, are usually the electronic type. Despite the frequent pressure for unpolluted atmosphere, there is no radical increase in the percentage of plants having dust collectors. This is undoubtedly due to the uncritical location of the plants reporting in this survey.

About half the companies report making use of flyash. Most of them use it for fill; however four plants use it for cement.

Heat Cycle Apparatus . . .

Thirty-five plants report use of the reheat cycle. This is over half of the reporting stations. It was used in all sections of the country, even in the relatively low cost fuel areas of the West South Central.

About half the plants obtain makeup water from more than one process. Evaporation and demineralization are generally used although zeolite is most often used in the West South Central area.

Welded hot-air ducts are used in 47 cases.

Condensing, Cooling Water . . .

Circulating water pumps, at one half of the plants, are at the screenwell. All but a few of the plants control slime by chlorination. This survey verified the findings of our recent Cooling Tower survey (EW, Sept 6) that more and more plants are using cooling towers.

Condensers . . .

About 20 of the plants (a large increase over the 1952 survey) use outdoor condensers. The condenser serves as the turbine foundation in two plants. Twenty-five plants put heaters in the throat, usually one or two although a few plants have three or four heaters in the throat.

Fans and Pumps . . .

The great majority of plants are using both ID and FD fans. Four out of five of these plants have two of each. Eleven plants do not have ID fans. Nine of these 11 plants have pressurized boilers. Probably the two pressurized boiler plants having the ID fans feel they are necessary for the sake of reliability. Outdoor ID and FD fans are used in all the reporting Pacific area plants. On a country-wide basis 20% of the plants have both fans outdoors.

Mechanical fan couplings are used in three out of four plants. Gas recirculating fans are reported by 30% of the plants. Four out of five plants have installed vertical condensate pumps.

Three boiler feed pumps per boiler are used in about 70% of the reporting plants. This arrangement of two half-capacity running pumps and one half-capacity spare gives reliability and permits flexibility for partial loads. One plant reports the use of five pumps per boiler.

Piping and Valves . . .

Forged piping is used for two out of three main steam lines. Mineral and aluminum shell insulation of high temperature pipes are being used in the same proportions reported in the last survey.

Plants from every section of the country report using some type of protection against freeze-up of outdoor piping. Routing and electrical heating are equally used as protective methods.

Cathodic protection is widely used in the West South Central area. Plants in the East North Central area did not report using it.

Thirty-four of the 35 plants using reheat steam have an intercept valve in the reheat steam line.

Turbines . . .

All except two of the turbines are tandem compound. These two cross compound machines are large units. Later information (EW, Aug 30, p6) indicates that even these large units can be the tandem compound type. Turbine turning gears are used by all companies. Twenty plants have quick start provisions, and 30% have thermal protection against motoring.

Alternators . . .

The extensive use of one outgoing transformer per turbogenerator is further proof of the acceptance of unit design. About 75% of the reporting plants follow this practice while 10% are still using three single-phase transformers. All but six plants report

the generator directly connected to the main power transformer. Most of the plants use isolated phase bus for this connection.

The large majority of the plants do not install a breaker in the generator neutral. They usually ground the neutral through a distribution type transformer.

Stator and rotor temperatures are considered important quantities by all the reporting plants, since every station has some type of stator and rotor temperature indication. Two out of three plants have stator temperature recorders, 20% use both recorders and indicators. Two out of three plants have rotor temperature recorders, 10% use both recorders and indicators.

All stations report using 30 lb hydrogen except two. One of these stations uses 45 lb hydrogen (156 Mw-unit) and the other uses 65 lb (100-Mw unit).

The dominate generator voltage reported is 13.8 kv. However, there is a definite trend to higher voltages. One-third of the plants use voltages higher than 13.8 kv. Five use 20 kv and one uses 12.5 kv.

Loss-of-field protection is provided at five out of six plants.

Excitation . . .

Exciters are directly connected in 80% of the plants. Over half the plants have a spare motor-driven exciter. Rheostatic, electrical, and magnetic field regulation are used. No one type is greatly preferred over the others. Twenty-three plants have provisions for transferring exciter sets under load.

Station Auxiliary Power . . .

In keeping with unit design most stations obtain auxiliary power through a transformer connected to the generator main leads. However, a puzzling piece of statistics is that 55 plants report obtaining reserve or starting power from a transformer connected to the generator bus. The survey's evidence of unit design indicates that there is no generator bus. Most plants use dead transfers to auxiliary source.

The typical auxiliary transformer is 3 phase, oil insulated, and self cooled. Power and lighting transformers however are dry type, probably because they are generally located indoors. Starting transformers are self-cooled or forced-air-cooled.

Because of the large number of outdoor plants, motors are mostly totally enclosed or weather protected. More than one type of motor enclosure is used by 20% of the plants.

Cable is run in trays, ducts, and pipes. Two out of three companies use the station battery to supply emergency power for the lube oil system and the hydrogen seal oil unit.

Control Instrumentation . . .

Practically all control rooms are air conditioned, and most of them are soundproofed. Usually either the turbine or switchyard is visible from the control room, sometimes both. Functional boards are the rule, with vertical sections for recorders, indicators, and annunciators. About 25% of the stations have bench sections for turbine, generator, and auxiliary controls.

Polyethylene, polyvinylchloride, and non-metallic sheath insulated cable is generally used. There are very few plants using mineral or lead sheath insulated cable. Trays are generally used for control cables.

Besides the extensive use of leased telephone, over half of the plants report carrier communications and 20% microwave for communications.

Buses . . .

Forty-three plants report having isolated-phase generator bus. This contradicts other information in the survey that indicates that the majority of the stations are of unit design.

The auxiliary bus is usually segregated and divided into either one or two sections. High speed sectionalizing of the auxiliary bus is used by 50% of the plants.

Twenty-three plants tie their ground mesh to piling. Twenty of these plants use copper ground systems. These plants do not mention using any means to protect the grounding system against galvanic corrosion. Cable racks are tied to the ground system in 30 plants.

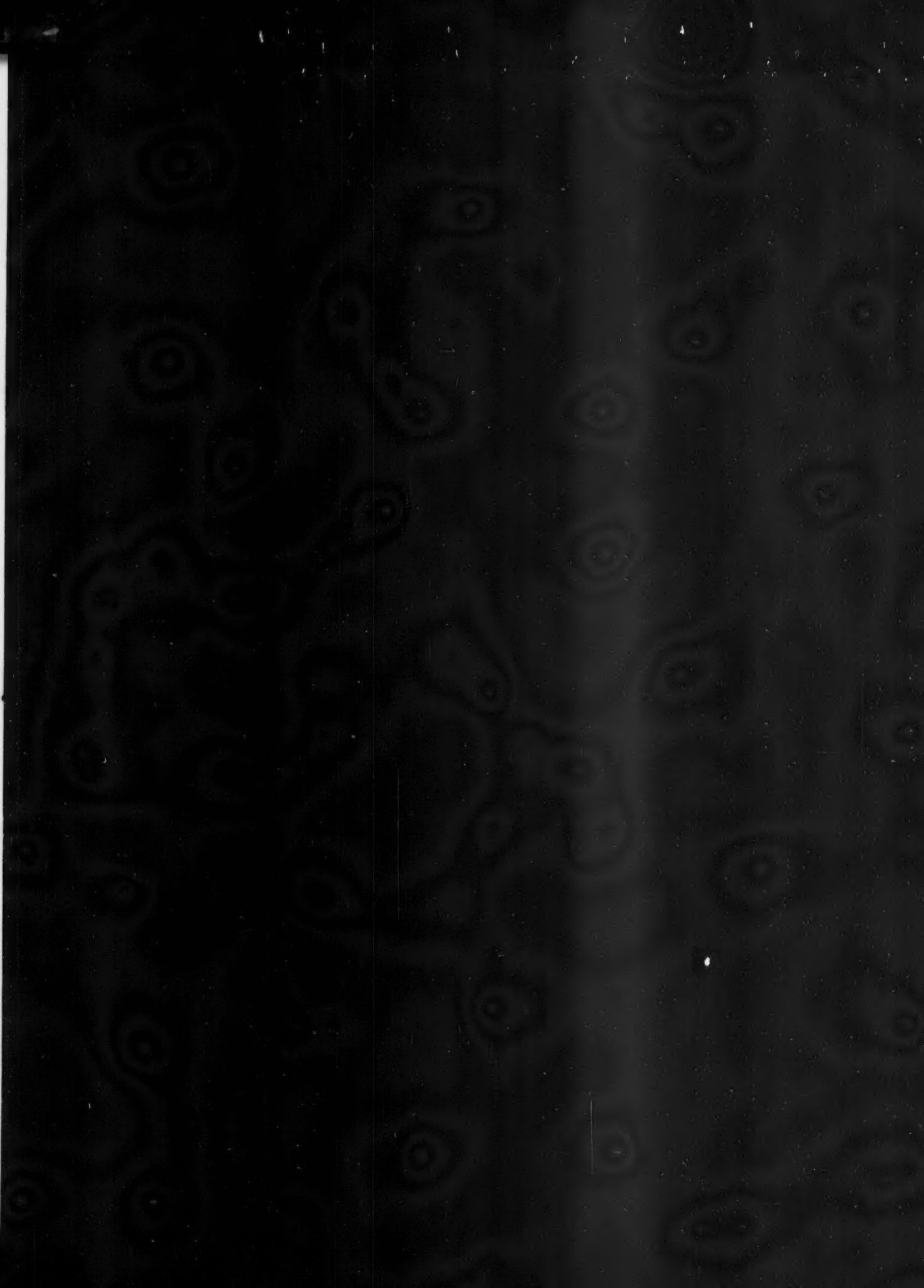
Outgoing Transformer Yards . . .

Two out of three main power transformers are provided with FOA cooling. Only three plants report tap changing under load. Most of the transformers have fire protection; over half use water.

All plants use some type of lightning protection, one-third use masts, one-third use a ground mesh, and one-third use both of these methods. Two out of three companies use lightning arrestors on the main transformer.

Lighting . . .

The use of luminous ceiling lighting in the control room has increased from 50% of the plants in the previous survey to 75% in this survey. General station lighting is usually incandescent, and outdoor units are usually flood-lighted. All except two stations use the control battery for emergency lighting. These two stations have a separate battery.



Electrical World's Third Steam Station Check Chart—

Plant Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Total initial capability — Mw	100	66	75	132.5	66	70	75	156	276	170	250	290	185	164	75	125	75	105	176	105	120	44	60	60	130
Number of units (Set/Unit)	1/-	1/1	2/-	1/-	1/-	2/4	4/1	1/1	2/4	1/1	4/1	2/1	6/7	2/4	2/3	1/1	5/5	1/1	5/6	5/6	1/4	1/5	3/7	4/5	2/1
Geographical area	ME	ME	ME	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	SA	SA	SA	SA	SA	EMC	EMC	EMC	EMC	EMC	EMC	EMC
Initial operation	1/56	1/54	1/52	6/54	10/53	9/54	11/54	10/55	3/54	10/56	-/52	3/53	-/55	12/53	11/55	2/56	9/53	6/53	1/53	6/56	11/54	3/55	-/56	12/55	3/55
Steam pressure	1800	1250	1450	1250	1250	1650	1450	1800	1800	1800	1450	2350	2350	1450	1450	1800	1450	1500	1250	1450	1800	1450	1450	1500	1800
Steam temperature (Sat'd)	1000	950	1000	950	950	1000	1005	1000	1050	1000	1000	1100	1100	1000	1000	1000	1050	1000	950	1000	1000	950	1000	950	1050
Steam temperature (Reheat)	1000		1000			1000	1005	1000	1000	1000	1000	1050	1050	1000	1000	1000				1000	1000		1000		1000
Prin fuels — (B)it, (A)nt, (L)ig, (Gas, (O)il	B	BO	B	B	A	B	BO	B	B	B	B	BO	bO	B	O	O	B	BO	B	B	B	B	B	B	B
Boilers per turbine	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Boilers per boiler	1	1	4	2	2	1	4	1	1	5	1	4	5	1		1	1	1	1	1	2	1	3	1	1
Pulverizers per boiler	4	4	4	2	2	4	4	2	4	5	4	4	5	4		4	3	4	3	4	2	2	3	4	5/Cyc
Feedwater pumps per boiler	3	3	3	3	3	2	3	3	3	3	3	2+Conn	3	2	3	2	2	3	3	3	2	2	2	2	3
FD/ID fans per boiler	2/2	2/2	2/2	2/2	2/2	2/2	1/1	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	1/1	1/1	2/2	1/1	2/2	1/1	2/2
Hydrogen cooling pressure, psi	30-60	0.5-35	15	0.5-30	0.5-15	25	0.5-30	45	0.5-30	0.5-30	0.5-30	30	30	15-30	0.5-30	0.5-30	0.5-30	0.5-30	0.5-30	0.5-30	15	0.5-30	0.5-30	0.5-30	0.5-30
Operators per shift . . . for . . . turbines	4/1	5/1	16/2		5/1	7/2	2/1		5/2	4/1	15/4	7/2	6/1	1/1		16.5		16/6	16/6	16/6	20/4	6/1	14.4	5/4	19/3	
Generator — kv	13.8	13.8	14.4	18	13.8	13.8	13.8		18	20	13.8	20	13.8	13.8	13.8		13.8		13.8	13.8				14	14.4
Outgoing transf per turbine	1	1	3-1-ph	1	2	1	2		2	1	1	2	2	2	1	1	1	2	1	1	1	1	1	1	2
General Features																									
No. of operating levels	1	2	3	3	3	1	1	2	1	2	4	2	2	2	2	2	2	2	2	2	2		2	1	2
Layout (C)onventional, (H)orizontal	C	H	C		C	C	C	C	C	H	C	H	H	C	C	H	H	H	C	C	H	C	C	C	C
Equipment outdoors (E)pt, (T)urb, (F)ans, (P)umps, (A)rrestor, (S)kgt Coil	FD		D	BTFAD			FPAD	D		BTFAD		BFAD	BFAD	D		FPD	FPD	FPD	FD	FD	FD			BADF	
Turbine on (R)oof with (G)antry				RG						RG															
Boilers close to turbines		●				●	●	●	●	●	●	●	●	●	●	●	●					●		●	
Pulverizers alongside boilers		●		●		●	●	●	●	●	●	●	●	●		●	●		●	●	●	●			
Vent coal-prep room		●		●								●	●	●				●							●
Scales (A)ctr, (S)eal coll, (F)eed	AF	ADF	ADF	ADF	ADF	F		ADF	ADF	ADF	ADF	ADF	ADF	AF	ADF	ADF	ADF	AF	A	A	AF		ADF	AD	AF
(G)rading floors, (F)orced air vent	GF	GF	GF	GF	GF	GF	GF	G	GF	G	G	GF	GF	G	G	G	G	F	G	G	GF	GF		G	G
Walls (A)ir, (B)rick, (C)onc-fnsh	A	AC	B	C-Blk	B-Gal	B	BAC	B	A	BC	B	B	B	C	C	Gal	C	C	AB	AB	C	B	B	B	B
Casings for (S)teel load pickup				Q		Q	Q	Q	Q	Q						Q									Q
Cranes, tons and No. of hooks	125/1	125/2	150/2	90/2	100/2	100/15	100/2	150/2	100/2	55,15/2	150/2	175/2	150/2	150,25/1	75/2	100,25	150/1	100/2	37.5/2	37.5/2	85/1	100/1	60/2	100/1	150/1
Stacks (B)rick (C)onc (S)teel	C	S	B	S	S	S	S	S	A	B	S	S	S	C	S	S	S	B	B	B	C	S	C	C	S
Fuel and Handling																									
Fuel Delivery (R)ail, (B)arge, (T)ruck, (P)ipe	B	RB	B	R	RT	R	R	RBT	RT	R	R	RB	RB	R	B	R	B	R	R	R	B	T	B	R	B
(C)onl-mine, (L)ignite field adjac				C				C	C		C							C							C
(H)oist also positions barge												H	H				●								
(R)ailway car dumper					R				R		R					R								●	
Hoppers accom 1,2,3 cars simul		1		1		1	2	1	1	1	1	3	2	2		1		1	2	2				1	
Coal thawed with (O)il, (G)as, (S)team		O		O	Hotair	O	O			O	O					O			O	O				O	
Grill blade breaks frozen mass																									
Car vibrator		●		●		●	●		●	●				●				●	●	●					
Single conveyor to stockpile or bunkers		●	●	●	*	●	●	*	●	●	●		●	●		●	●	●	●	●	●	●		●	●
Unloading (G)antry, (L)oco, (E)levmotcrane			S	L	L	L		B									UTow		L	L			B		U Tow
Piling (L)oco, (G)antry, (C)onveying	E	E*	G	E	GE	E	E	E	E	E	E	E	E	E		E	E	E	E	E	E	E	E	E	E
Haul (w)g (L)oco, (D)rag (E)arth-moving	E	E		E	E	E	E	E	E	E	E	E	E	E		E	E	E	E	E	E	E	E	E	E
Tramp-iron separator (M)agnetic		M	M	M		M	M	M	M	M	M	M	M	M		M	M	M	M	M	M	M	M	M	M
Pile heated for (W)ind-blow, (S)nowed bridges			W			WS		W		WS						W	W	S				S			
Coal Sampled (C)ontin (I)ntermittent	C	I	I	I	I	C		I	I		C	I		I		C	C	I	I	I	I	I	I	I	I
Weight (T)rain, (F)low-meter, Str (G)auge	S	S	SF	S	S	S	S	S	SFG	S	S	S	S	S		G	S	S	S	S	S	SF	S	S	G
Fuel Economy (I)ntegrated (T)allied	I	IT	IT	I	I	T	T		I	T	IT	I	I	T	I	I	T	I	I	I	T	I		I	I
Pulverizer type (B)all, (R)obl	o	a	a	a	a	o	A	a	a	o	o	o	a	o		a	a	o	o	o	Roll		a	o	
Bunker chutes (S)traight, (V)ibrated		SV	V	S	V	SV	S	S	SV	V	V	SV	SV	S		S	S	V	V	V	S	S	S	S	SV
Bunker capacity — 7 hrs operation	60	32	76	46	72	50	30	70	80	37	40	4	4	60		36	67	48	30-29	30	19	32	16	24	30
Steam Generator																									
Boiler (O)utdoor, (S)emi-outdoor				O						S		S	S											S	
Burner area (I)ndoors, (O)utdoors				I	I	I	I	I		10	I	I	I	I	I	I	I		I	I	I	I	I	I	I
Pressurized furnace — in.									30			38	41												40
No. of drums	1	1	1	1	1	1	1	1	1	1	3	2	1	3	1	2	2	1	1	1	1	1	1	1	2
No. of burners per boilers	16	12	12	12	12	16	12	12	16	20	16	56	20	16	12	16	9	16			16	6	6	16	
Burners (T) or (V)ert, (T)angential	T	H	H	H	V	T	H	V	H	T	T	T	H	T	H	H	H	T	T	T	V	H	H	H	
Casing (L)agged, (W)elded (C)as-tight	WG	L	W	W	W	W	W	WG	LWG	WG	L	G	G	W	W	L	L	W	L	L	WG	L	W	L	G
(C)yclone furn, Stoker (U)nderfeed, (S)preader																									C
Supht, contr (D)amp, (B)urner (S)pray (G)as recirc (C)ont'd's (T)win furn	S	SG	S	C	C	BS	DG	S	SG	S	S	BSGT	DSGT	BS	GDS	DG	Attemp	S	S	S	B	S	S	S	SG
Reheat contr (D)amp, (B)urner tilt, (S)pray (G) as recirc (C)ont'd's (T)win furn	BS		S			BS	G	D	SG	B	B	BSGT	DSGT	BS	CD	DG		BS	S	S	B		D		SG
Circulation (N)atural (C)onto (D)ual	N	N	N	N	N	N	N	N	N	N	C	C	N	N	N	N	N	C	N	N	C	N	N	N	N
Welded platens for tubes, (W)alls (S)upt (R)ntn		S					SR			SR											W		WS		W
Provided for (S)upprtr (R)eheater		S	SR	S	S	SR	S		S		SR	SR	SR	SR	S	S	S	SR	S	S	S	S	S	S	S
Torch for burner ignition (G)as, (O)il	O	O	O	O	O	O	O	O	O	G	O	O	O	O	O	O	GO	O	O	O	O	O	O	O	O
TV for (G)auge, (B)urners, (S)tack	B					CD	B			GB	G	GFurn	G	B	GB				GB	GB					G
Ash Control and Disposal																									
Furnace (D)ry, (W)et bottom	D	D	W	D	W	D	D	D	D	W	D	W	W	W	D	D	D	D	D	D	D	D	D	D	W
Soot-blowers (R)etract (L)ance (M)anual	R	R	R	R	R	RL	R	R	R	R	R	R	R	R	R	R	RLM	RL	R	R	R	R	R	R	R
Soot-blowers (A)ir, (S)team (A)uto ser,	AA	SA	A	SA	ASA	AA	A	S	AA	AA	A	AA	AA	AA	SA	SA	S	SA	S	S	NSA	A	S	A	AA
Combustible ash (R)einjected												R	R												
(M)ech & (E)lec or (E)lec & (M)ech coll'rs	ME	ME	E	E	EM	M		ME	E	ME	M	ME	ME	M	M	ME	M	M			M	M	M	M	E
Collectors outdoors (M)ech (E)lec	ME		E	E			M	ME	E	ME		ME	ME	M		ME	M	M	M	M	M		M		
Coll bnks, hot-cold sect, air prehtr		AP&HO																							
Precipitator rectifiers (R)otary (E)lectronic	E	R	E	R	E				E	R		R	E			E									R
Bottom ash sluiced		●	●	●	●	●	●	●	●	●	●	jet	jet	●		●	●	●	●	●		●	●	●	●
Flyash used for (F)ill (C)ement (A)sph fil		F	F	F		F		F	F	F	FC	FCA	FCA	F			C				F	F	F	A	
Heat Cycle Apparatus																									
Makeup (E)vap, (Z)eol, (D)emin, (T)reated	D	D	ET	ET	EZ	E	D	E	D	ET	D	D	D	E	E	E	E	D	ET	ET	D	D	E	D	D
FW solids held to ____ ppm, pH ___/___		4.6/8	.5,7/8	8.8,1/8,3	1.6,4/6,8	-,2/8	-,-/7	1,7+/1	1,8,1/8,5	5,6.5/-	1,8/-	1,8/8,5		1,-8,6/-	5,8,4/8,6	.02,8,9/9,1	.02,8,9/9,1	-,1/9	1,6/9	1,6/9		.8,-/-		.1000/-	.5,8,5/
Economizer pH at		7.0		8.1-8.3	6.6		8.5*	7+		6.5	8	8-8.5				8,9-9.1	8,9-9.1	9							
Final FW temp at economizer	410	426	480	426	420	540	440	454		484	450	525	520	497	452	465	445	465	416	455	454	423	460	540	468
FW htrs group by-passed (O)ff, (L)P, (N)o	H	HLN	H	HL	HL	H	HL	HL	HL	HL	LP	HL	HL	N	N	HL	HL	N	N	N	Dual		MP	H	L
Deaerating FW htr (O)pen, (C)losed	None	O	O	O	O	O	O		O		O			O	O	O	O	O	C	C			C	C	C
HP heaters in (T)win room (A)bove, (B)elow	T	A		Tdeck	B	A	A	B	TA	B	A	T	T	B	AB	TB	TB	A	A	A	BtwR	B	B	T	A
LP heaters in (T)win room (A)bove, (B)elow	T	B		B	B	TA	B	B	TA	B	TB	TB	T	B	AB	TB	TB	T	AB	AB	TB	B	B	B	B
Air ht (O)xygen, (O)il, (S)plit for htrs	H	H	S	R	R		S	R	S	ROS	R	ROS	ROS	R	RS	R	R	R	R	R	R	S	R	R	S
Steam for reheat (T)empers heater air	T			T			*					*	*			T									
HT alloy metal minimized by extracts (No.)																									
Press'd hot-air ducts (W)elded		W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W		W	W	W				W
Condensing, Cooling Water																									
Screen enclr at plant wall			●			●		●						●					●	●	●	●		●	
Circ pump at screen encl		●	●	●		●	●(Z)	●		●	●	●	●		●	●	●		●	●	●	●	●		●
Diff head activates screen				●				●	●		●	●	●	●		●			●	●					●
Recirc to (S)tream, (B)asin, (P)ond		S	B		S			S	P		S		S	S	S	B			S	S	In C	B	S	S	S
Chlorinated for slime control	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●		●	●
Cooling (T)ower, (I)nduced, (F)orced draft									T1										T1	T1					
Wells for (C)asing, (D)rinking		D			CD	CD	D								CD			C	CD	CD	D	CD		CD	D
Plastic pipe for circulation of chemicals		*						●		●														●	
Condenser																									
Cond (O)D, serves as Tnk (F)oundation						F																			
Heaters in Hotwl (No.)	1	1	1	2		1	2	1	1		3		4		H Rel				1	1			1		
Deaeration in (H)otwell, (C)ondenser	C	C	H			C		C		C	C	C	C		H			M	C	C	C	H	H	H	C
Divided water-box (T)wo-pass (O)ne-pass	T	T	O	T	T	O	O	O	T	O	O	O	O	T	T	T		T	T	T	O	T	T	T	O
Twinned for side-exhit turbine																									
Set low for siphon oper		●			●				●		●				●	●	●				●	●			●
Hogging jet (S)team, (A)ir		S	S	S		S	S	S	S	S				A	S		S	S	S	S	S	S	S		
Maximized condensate retrig			●		●			●	●	●	●				●	●	●	●	●	●	●	●				●
Fans and Pumps																									
FD/ID fans per boiler (No. ea)	2/2	2/2	2/2	2/2	2/2	2/2	1/1	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	1/1	1/1	2/2	1/1	2/2	1/1	2/2
Outdoor loc (F)D, (I)D fans	I			F1			F1		F1		F1	F1	F1			I	I	I	I	I	I			I	
Fan couplings (H)yd, (E)lec, (M)ech		HM	M	M	M	H	M	M	M	M	MH	H*	H*	M	M	H	H		M	M	M	M	H	H	HM
ID fans used only during stce																									
Gas recirc fans per boiler (No.)		1					1		1			2	1		1	Q									Z
Feed pumps per boiler (No.)	3	3	3	3	3	2	3	3	3	3	3	2+Conn	3	2	3	2	2	3	3	3	2	2	2	2	3
Boost/drives shaft stemm on FWpump										●		●	●	●	●	●		●	●	●		●		●	
Turbine oil pump drive (S)haft (M)otor		SM	S	M	S	S	S		S	S	S	SM	SM	S	SM	SM	M	S	SM	SM	SM	S	S	SM	S
Vertical condensate pumps	●	●		●	●	●		●	●	●	●	●	●		●	●		●	●	●	●	●	●	●	
Liquid slip regulator on FW pump		●			●						●							●					●		
Pos Displ rotary vac. pump	●				●						●	●	●			●								●	●
Pumps for cond circ (No)												3						3			3				
Piping and Valves																									
Main steam line (F)orged, (S)eamd		F	FB		FB	B	F		B	F	B	FB		F	Roll	FB	FB	FB			FB	F		F	B
Valve bolts against A-tank ship omitted								●		●		●				●	●				●				
Dual safety valve in superht reheat			●			●				●	●	●	●			●									
Intercept valve in reheat (Yes, No)	Yes		Yes			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes*	Yes		Yes		Yes	No		Yes		Yes
Fixtures up exerted by (S)tuding (F)lec bl			R	E		R	R	R		R		R	R		R	R	RE		R	R	E			RE	
Cathodic prot for buried pipe		●		●						●		●				●									
Insul of HT pipe (M)ineral, (A)sbs shell		MA	M	M	M	M	M	M	M	M	M	MA	MA	M	MA	M	M	M	M	M	M	M	M	M	M

Continued on Reverse Side

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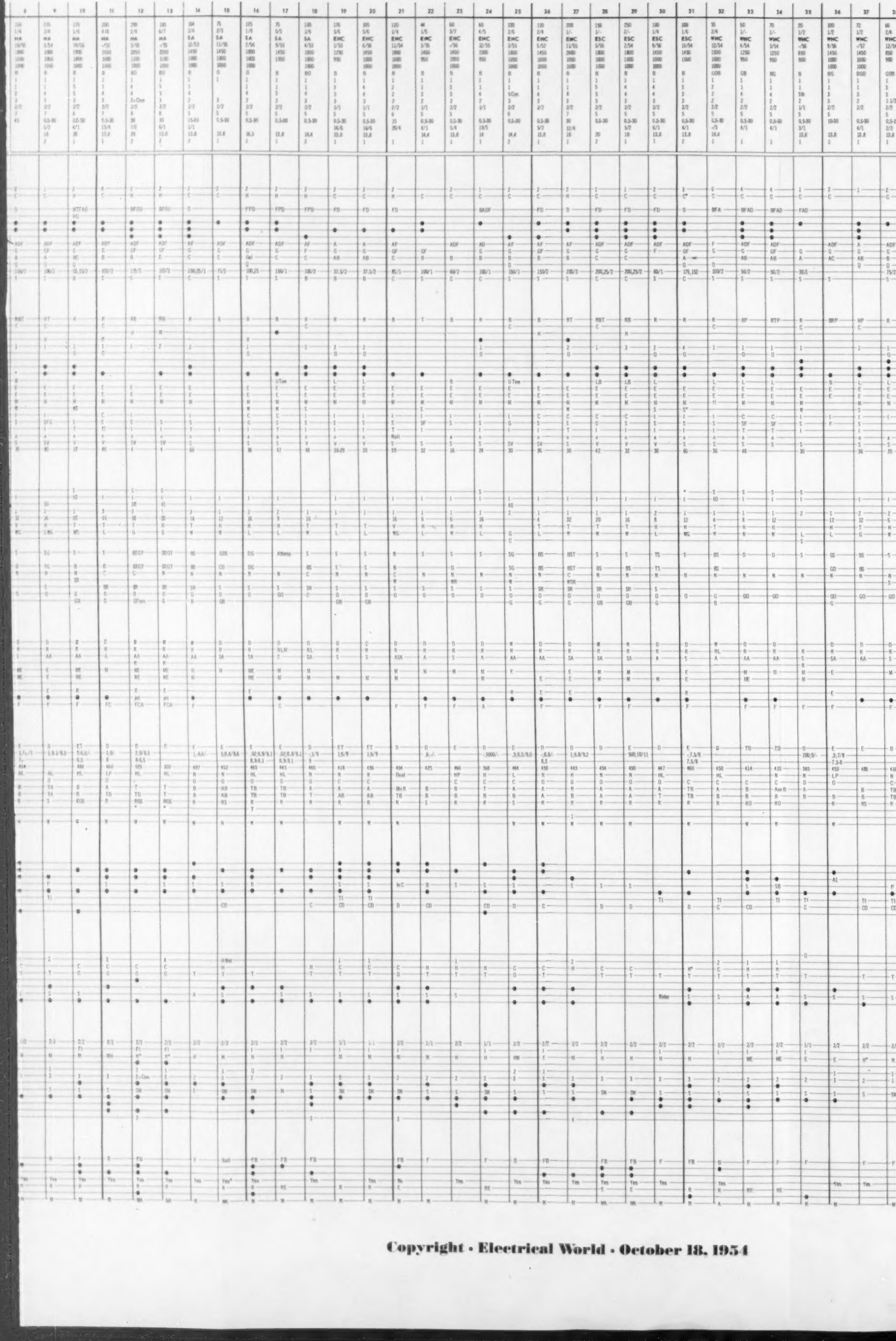
rt—Design Characteristics Covering 65 New Power Plants

	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53
	330	310	200	156	250	100	100	55	50	70	20	100	72	66	125	65	110	135	65	186	87	66	80	110	220	82	80	100	30
	2/6	2/4	1/-	1/-	2/-	1/4	1/6	2/4	1/-	1/-	1/2	1/2	1/2	2/4	2/4	2/4	1/4	1/4	4/4	1/6	1/-	1/8	1/3	1/3	3/-	4/4	2/6	2/-	1/-
	EHC	EHC	EHC	ESC	ESC	ESC	ESC	WHC	WHC	WHC	WHC	WHC	WHC	WHC	WHC	WHC	WSC	WSC	WSC	WSC	WSC	WSC	WSC	WSC	WSC	WSC	WSC	WSC	WSC
	3/55	5/52	11/55	5/56	2/54	9/56	10/54	12/54	4/54	3/54	-/56	9/56	-/57	12/54	4/53	2/58	7/54	1/57	5/54	2/56	5/53	6/54	6/54	4/55	5/55	9/54	-/54	3/55	2/54
	1800	1450	2400	1800	1800	1450	1450	1500	1250	1250	850	1450	1450	850	1250	1250	1040	1040	1290	1860	1250	1250	1436	1450	1450	1750	900	1450	800
	1050	1000	1050	1000	1000	1000	1450	1000	950	950	900	1000	1000	900	950	950	1000	1000	900	1000	1250	950	1000	1000	1000	950	900	1000	900
	1000	1000	1000	1000	1000	1000	1600	1000				1000	1000		950		1000	1000		1000			1000	1000	1000			1000	
	B	B	B	B	B	B	B	GOB	GB	BG	B	BG	BGO	GOB	BG	GO	GO	GO	GO	GO	GO	GO	GO(Fut)	GOL(Fut)	GO	GO	GO	GO	GO
	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	1	1	1	5	4	4	3	2	1	1	1	3	1	3	1										2 Fut				
	5 Cyc	4	R	5	4	4	3	2	4	2	Stk	3	3	3	4										4 Fut				
	3	3	R	5	3	3	3	2	2	2	2	3	2	1 1/2	3	3	3	3	3	3	3	3	3	3	2	3	1	3	2
	2/2	2/2	3/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	1/1	2/2	2/2	2/2	7	4	5	6	4	5	6	5	6	5	2/0	2/2	2/0	2/0	1/0
	6		7	5	5	5	5	5	5	5	5	5	5	5															
	0.5-30	0.5-30	0.5-30	0.5-30	0.5-30	0.5-30	0.5-30	0.5-30	0.5-30	0.5-30	0.5-30	10-30	0.5-30	0.5-15	0.5-80	0.5-30	0.5-30	0.5-30	0.5-30	0.5-30	0.5-30	0.5-30	0.5-30	0.5-30	0.5-30	0.5-30	0.5-30	0.5-30	0.5-30
	14.4	13.8	12/4	20	18	6/1	4/1	-/3	4/1	4/1	3/1	13.8	4/1	2/2	8/2	4/2	15.5	20	13.8	3-1 ph	13.8	23.8	13.8	5/1	3/1	13.8	14.4	13.8	6/2
	2	1	1	2	1	1	2	1	1	1	1	1	1	1	1	1	2	2	1	1	1	1	2	2	1	1	1	1	1

	2	2	2	1	1	2	3	5	4	4	1	2	1	2	2	2	1	1	2	2	2	2	1	1	2	3	2	3	1
	C	C	H	C	C	C	C*	C	C	C	C	C		C	H*	H					C	C	C	H		C		C	C
		FD	D	FD	FD	FD	D	BFA	BFAD	BFAD	FAD				FAD	BTFA	BTFPA	BTFPA	BTFPA	BTFPA	BTFPA	BFA	BTFPA	BTFPA	BFPA	BFA	BTPA	B	B
																RG	RG	RG	RG	Pod G	Pod G		Pod G	Pod G		RG	RG		
	AF	AF	AF	ADF	ADF	ADF	ADF	F	ADF	ADF		ADF	A	ADF	DF	AF	AF	AF	AF	AF	F	F			AF		F	AF	
	G	GF	G	G	G	F	GF	G	C	GF	G	G	G	C	GF					F		G			G			GF	F
	B	B	B	C	C		A		AB	AB	A	AC	AB	B	InSB	C Bla	B	B	A	C	A	B			C	B	C	A	A
	Q						Q						Q	Q								Q						Q	Q
	150/1	150/2	200/3	200,25/2	200,25/2	60/1	175,152	100/2	50/2	50/2	30/1			75/2	100/2	35/2	45/3	45/3	25/3	55/2	45,30/2	40/2	50,10/1	55,15/1	150,10/2	35	30/1	50/7	50/2
	S	S	S	C	C	S	C	S	S	S	S	S	S	S	S	C	C	C	C	S	S	S	S	S	S	B	S	S	S
	B	B	RT	RBT	RB	R	R	R	RP	RTP	R	BRP	RP	R	BR(Fut)	R	P	P	P	P	PRT	P	PRT	PRT	R	BP	PRT	P	P
	C			C	H			C			C		C		H														
		H																											
			2				4		1	1	1			1	1														
			D	1	3	2	O	1	O	O			1	O	O														
	U Tow			LB	LB	L		L	L	L		B	L	L	B										L				
	E	E	E	E	E	E	F	E	E	E	E	E	E	E	E										E				
	E	E	E	E	E	E	F	E	E	E	E	E	E	E	E										E				
	M	M	M	M	M	M	M	M	M	M	M		M	M	M										M				
			W			S	S*				W		S		S														
	I	C	C	C	C	I	I	I	C	C	I	I	I	I	C														
	G	S	S	S	S	S	S	S	SF	SF	S	F	S		S							F					I		I
	I	I	T	I	I	I	I	I	T	T	I		I		I														
		o	o	o	o	a	a	o	a	a			o	o	o														
	SV	SV	S	V	V	V	S	S	S	S	S		S	S	S														
	30	36	30	42	32	30	60	36	48		30		36	20	48														
	I	I	I	I	I	I	*	S	S	S	S				E	O	O	O	O	O	O	O	O	O	O	I	O	O	O
	40						I	10	I	I	I		I	I	I	I	O	O	O	O	O	O	O	O	O	I	I	O	O	O
	2	1	1	1	1	2	1	1	1	1	2	1	2	2	1	3	1	1	3	1	1	1	1	1	1	1	1	2	2
		4	32	20	16	8	12	4	8	12		12	12	6	16	8	18	24	12	24	12	10	15	16	16	12	15	16.2	16.2
		T	T	T	T	H	H	T	H	H		H	T	H	T	H	H	H	H	H	H	H	H	T	H	H	2	2	2
	G	L	W	W	W	L	WG	W	W	W	L	L	G	W	W	W	WG	WG	L	LWG	LWG	W	LWG		L	L	G	8G	8G
	C										S																		
	SG	BS	BST	S	S	TS	S	BS	D	D	S	GS	BS	S	BS	C	DG	D	D	D	G	S	DG	DGB	S	D	D	B	B
	SG	BS	BST	BS	BS	TS		BS				GD	BS		BS			D		D				DB	DG	DG		S	
	N	N	C	N	N	N	N	N	N	N	N	N	N	N	N	D	N	N	N	N	N	N	N	N	N	N	N	R	N
	W		WSR											S											W				W
	S	SR	SR	SR	SR	S									SR	S	S	SR	S	SR		S			S	S	S	SR	S
	O	O	O	O	O	O	O	G	GO	GO		GO	GO	GO	G	S	GO	GO		O			G	G	G	G		GO	GG
	G	G	G	GB	GB	G		B				G			G	G												GB	GB
	W	D	D	W	W	D	D	W	D	D	R	D	D	D	D										R				
	R	R	R	R	R	R	R	RL	R	R	R	R	R	R	R										R				
	AA	AA	SA	SA	SA	A	S	A	AA	AA	S	SA	AA	S	A										S				
											R																		
	F	E	E	M	M	M	E		M	M	M	E		M	E														
		E	E	M	M	M	E		ME		M				E														
	R	E	E				R					E			E														
		F	F	F	F	F	F		F	F	F	F	F	F	F														
	D	D	D	D	E	D	E	Q	TD	TD	D	E	E	D	ED	EZ	EZT	EZT	EZT	ED	EZ	E	EZ	EZ	E	EZ	E	EZT	EZT
		.5,8.5/9.0	-,8.5/-	1,8.8/9.2	500,10/11		-,7.5/8				200,9/-	.5,7/8			.6,8/-							-,2.4/8.3			-,-/.9*		10,8/9		
			8.5				7.5/8					7.5-8										8.3				.5,6.5/8.6			-,1/8.5
	464	450	443	454	450	447	460	450	414	415	265	453	485	460	645	364	416	462	364	461	364	420	398	420	395	425	310	450	440
	L	N	H	N	N	ML		HL		N	N	LP		N	N	L	N	R	N	N		HL	HL	HL	R	N		LP	N
	C	O	O	O	O	O	C	C	C	C	O	O		C	O	None				O		O			O	O	O	O	O
	A	A	R	A	A	A	TB	A	B	Aux B	A		B	TB	A	T	Out	Out	Out	A	Tank D	A	A	A	T	Adj	I	B	B
	B	A	B	A	A	T	TB	B	B	B	B	B	B	TB	AB	T	Out	Out	Out	B	B	T	B	B	T	B	I	B	B
	S	R	R	R	R	R	R	R	RO	RO		R	RS	R	O	R	O	ROS	O	ROS	O	D	O	R	R	Tab		R	R
															*														
			I																						I				
	N	W	W	W	W		W		W	W		W			W	W				W	W	W	W		W		W	W	W

s Third Steam Station Check Chart—Design Characteristics C



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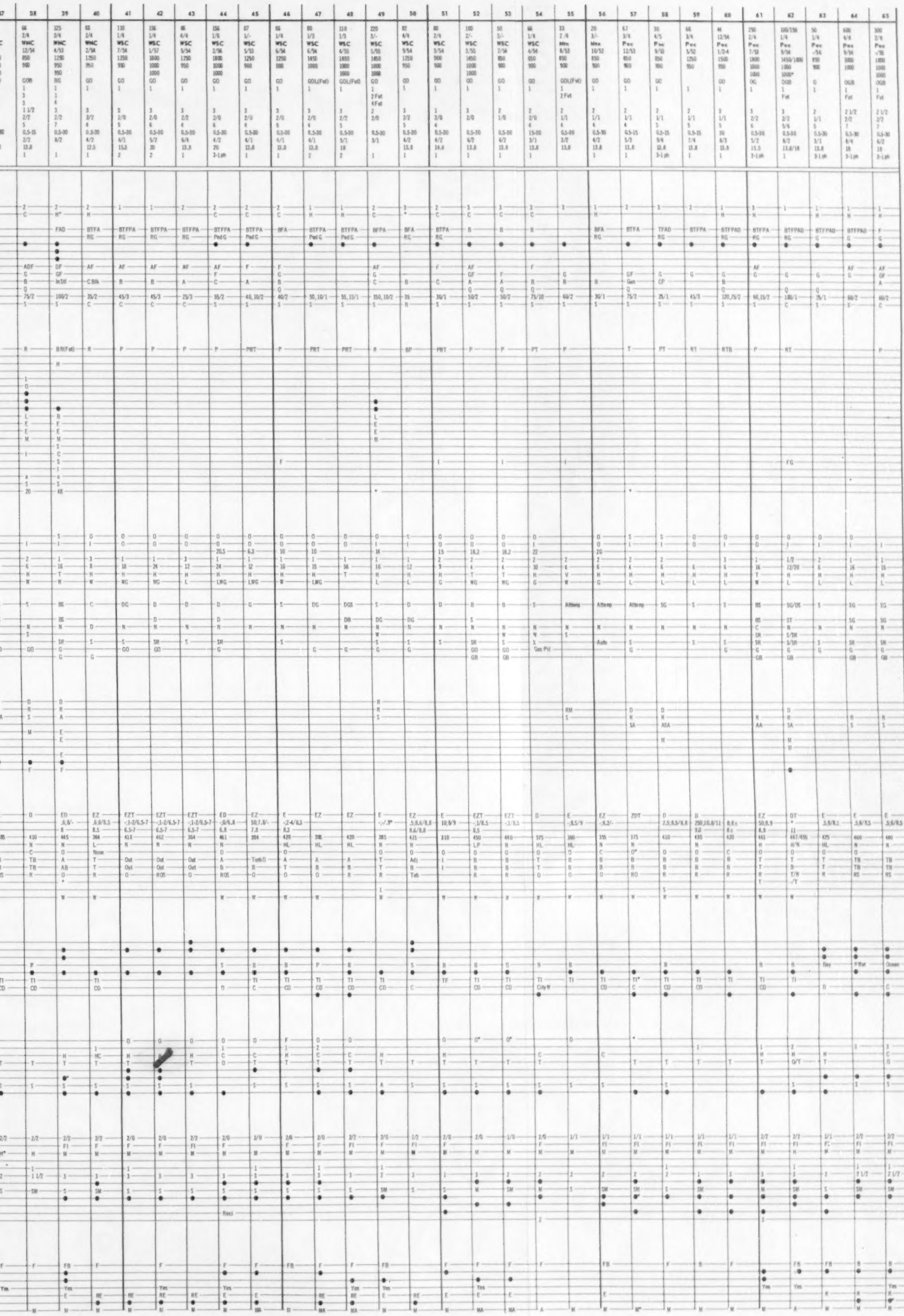
s Covering 65 New Power Plants in the United States



Key to Abbreviations and Identity of Plants on Reverse Side

Electrical World's Third Steam Station Check Chart—

Plant Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Turbine																									
(Single-barrel, (Tandem, (Cross-comp	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	C	T	T	T	C
Side-outlet exhausts						●						●													
Turbine supported by condenser																									
Flow (Opposed, (Double	D	D	D	D	D	D	OD	D	D	DTrFl	OD	O*	O*	OD	D	OD	D	OD	D	D	O		D	D	O
Valve chest at middle	●					●	●		●	●	●			●	●			●							●
Emergency stop valve (Incl (Omitted	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Lube pump drive (Elec, (Mech		E	M	E	E*	E	M	EM	EM	M	M	E	E	M	M	M	E	E	M	M	EM	EM	M	EM	E
Turning gear	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	Port	●	●
Quick shaft positioner		●		●				●	●	●	●	●	●											●	●
Thrust pad against reversing				●		●																			
Alternator																									
Stator cooling (Work, (Electr (Water	H	H	H	H	H	H	H	H	HD	D	H	H	H	H	HD	H	H	HD	H	H	H	H	H	H	H
Rotor cooling (Hydr (Electr (Water	H	H	H	H	H	H	H	H	HD	D	H	H	H	H	HD	H	H	HD	H	H	H	H	H	H	H
Stator temp (Recorder (Indicator	R	RI	R	R	RI	I	R	RI	RI	R	R	R	R	R	RI	R	I	R	R	R	RI	R	R	R	R
Rotor temp (Recorder (Indicator		R	R	R	R	I	I		RI	R	R			R	R	I	I	R	R	R	R	R	R	R Rot	R
(Condensate (Fluid to cools hydr	C	S Wat	C	S Wat	W	C	C	C		C	C	C	C		W	H Wat	H Wat	C	W	W	E	W	S Wat	R Wat	Steam
Hydr cyl (Oil to safety			●	●				*		●											●				●
Core dr to transformer	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Gas leads (Fast-pt, (Oil-n-static	I		I	I	I	I	I	I	I	I	I	I	C	I	I	I		I	I	I	I	I	I	I	I
Fuse for loss of field			●	●	●	●	●	●	●	●	●	●	●		D	X	X	R	D	D	D	X	D	D	R
Haul grdnd (N), (X), (Oth, (of		O	X	O	NO	D	D	D	O	D	*	R	R	R	D	D			Ne	Ne	No	Yes	No		No
Gdr is not going (Yes, (No	No	No	No						No	No	No	No	No		No										
Excitation																									
Main exc (Air-cool (Wtg, (Enclosed	D	D	D	M	DE	W	D	M	E	D	D	W	M	D	D	M	M	D	M	M	D	D	D	D	D
Pilot exc (Shaft exc (Mtg on	D	D	D		D	W										M	M	M				D		D	
Spare exc (Motor driv, (Wire	M	R	M	M	*	M	W	M	R	R	M	M	M	M	W	N	N	N	N	N	N	N	N	R	M
Exctr, excite, (Self, (Battery (Pilot reg	S	S	S	R		S	S	R		S	SR	R	R	S	SR	S	S	SR	R	R	R	S	S	pilot	RS
Field supp (Rheo, (Magn (Electric		RE	E	R	ME		E		W	R	E			M	M	M	D		E	E	E	R	R	R	R
Salv transformer under load	●		●		●	●	●	●			●							●			●				●
Station Auxiliary Power																									
(Shaft gen (Tbl off (Gen leads (Bus	TG	TG	TG	TG	TG	TGB	TG	TG	S	TG	TG	S	B	B	TG	S	S	G	T	T	TG	T	T	T	TG
Bus source tbl off (Line tbs (Comm tbs	I	I	I	I	I	I	I	I	P	I	I	I	G	I	I	I	I	I	I	I	I	I	I	I	I
(Wind, (Line transfer to aux sources	D	L	L	L	L	L	L	L	L	L	D	D	D	L	L	L	L	L	D	D	L	D	L	L	L
Aux tabs, (Three-phase (Dry, (Oil type	TO	TO	TO	TO	TO	TO	TO	TO	TO	TO	TO	TO	TO	TO	TO	TO	TO	TAo	TO	TO	TO	TO	TO	TO	TO
Aux tabs (Unit, FO, FA, FOA cooled	FA	S	S	FA	S	S	S	OA/FA	S	S/FA	FA	FOA	FOA	S	OA/FA	S/FA	S	S	FA	FA	S	FA	FA	S	S
Stg tabs (Unit, FO, FA, FOA cooled		S	S	FA	S	FOA		OA/FA	FOA	S/FA	FA	FOA	FOA	FA	OA/FA			S/FA	FA	FA	Std	FA	FA	S	S
(In-house (metal-tm aux & off tabs		75		Std			None			73-70	60					Std	90				1500				
Star water tg on LV bus				2500	700	100	100	2000	1750	100	1250	3000	3000		125	250	1000							125	3000
Types OD water cool (Tbl (WF, (SF, (WP	M			W			W			W	S	T	M		T	WT	TS		W	W	W	W		M	T
Aux pump type (Piston, (Mtgs	M	M	FM	M	FM	M	M	M	M	M	M	M	M	P	M	M	M	M	M	M	M	M	P	M	M
Compose air for 10 sta. bus,					W																				
Space comp for sta monitors			●		●				●																
Power & light tabs (Dry, (Oil type		O	O	O	DO	O	O	D	D	D	D	D	D	O	D	As	DO	D	O	O	DO	D	O	O	D
Emerg (Lts off, (Ind seal off battery		LH		LH	LH	LH	LH	L		LH	L	L	LH	LH	LH	LH	LH	L							●
Aux cable in (Duct (Tray (Pipe		DTP	O	DTP	SP	D	DT	P	O	P	P	DT	DT	DTP	DP*	DTP	P	P	TP	TP	DP	TP		P	DTP
Control Instrumentation																									
Control cont stevon (12 (2) (3) units	2	1	2	2	1	2	1	4	2	2	2	2	1	2	2	2		*	5	1	2*	2		3	2
Operators con sce (Turbine (Switchyard		T	T		TG	T	T	T	T		T	T	T	T		T			T	T		T	T		S
(Air-conditioned, (Unventilated			A	AS	A	AS	A	AS	AS	AS	AS	AS	AS	AS	A	AS			A	A	AS	A		AS	A
No., in shift for each & elec oper		5	16			3	2		1	2	2	2	1	2	2	5			15	15	15	4	5	19	8
In-bounds ground functionally		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●	●	●	●		●
Recruitment for (Turbine (Line (Aux			TG		TA	TGA	TGA	A	TGA	TGA						TGA					G				GA
Vert board for (Units, (Auto (Aux sects		RIA	RIA	RIA	RIA	RIA	RIA	RIA	R	RIA	RIA	RIA	RIA	RIA	RIA	RIA	RIA		RIA	RIA	RI	RIA			RA
Transducers avoid high dr on board												●	●												
Mimic conn system (Elec (Hyd (Pneum			P	EP	EP	EH	P	P	EP	P	P Pwr	P	P		●	EP	EP		EP	EP	EP			EP	None
Hal-hdll lights for normal, Lower space							●	●		●											●	●			●
Flashing annunc act board lay				●			●	●		●		●	●	DPRT	T	TDP	T	PT	TP	TP	T	DPT		P	DPT
Cont cables in (Duct (Pipe (Crack (Tray	T	DT	DP	PT	PT	T	DT	T	T	T	T	DT	DT	N	P	N	Temp	N	PLN	PLN	N	PNLN		PN	L
Cable (Polyeth pvc (Slo ins (Lead sheath																									
(N) no-metal sheath		N	L	M	PNP	P	P	*	P	PNN	PN	L	L	TC	TC	TM	TM	TC	TC	TC	T	TC	C	TC	TC
Comm, (Telev, (Carrier, (Microwave	T	TC	TC	T	T	TC	T	T	TC	TC	T	T													
Sound-powered intercoms											●			●	Phone	●		●	●	●	●			●	●
Plastic address sys sensed plant	●	●	●	●	●	●	●	●	●		●	●	●												
Disturbance starts (Auto oscillo, speeds up (Recorders			AR					AR			A	A	A			A	A		A	A	A	R			A
Buses																									
Gen bus (Unit-ph (Sing ph				I	I	I	I	I	I	I	I	I	Pipe	I	I	I	Cable	I	I	I				I	I
Gen sw gr (Unit ph (Sing ph			I		I	I	I			S	I			S	I									None	None
No. gen bus sect (1), (2), (3) Oring		I			I	2	I	None	I	I	4	I	2	I	I		2							I	None
Aux bus (Unit ph (Sing ph			I		I	I	I	S	S	S	I	I	I	S	I			S	S	S		S			Ins B
No. aux bus sect (1), (2), (3) Oring		2	2		2B	2	I	2	3	I	4	2	3	2	2	2	2	2	1	1	2	1		4R	2
High-speed section of aux bus			●		●				●		●			●	●						●				
Swapping reduced for site gnd						W	Wood	●			●				●	CuWd	●								
Piling tied to (Copper, (Steel gd mesh		C	C	*		C	C	C			C	C			C		C					C		C	
Cable mesh-ridge with gd mesh		●			●							●	●		●				●	●	●				
Outgoing Transformer Yard																									
Tofn rating ___ gh, ___ mva		3/83	1/35.7	3/17t	3/41.6	3/82	3/60	3/17t	3/17t	3/150	3/110	3/110	3/130	3/30	3/30	3/160	3/t0	3/67.5	3/33.5	3/130	3/145	3/60	3/60	3/130	3/100
Cooling (Unit, (FO, (FA), (FOA)	FOA	FA	t	FOA	S/FOA	FOA	FOA	FOA	FOA	FOA	FOA	FOA	FOA	FA	OA/FA	FOA	FOA	FOA	FOA	FOA	FOA	FA	FA	S	FOA
Taps changed under load	Ro																								
Sky wells serves at ground lentns										●															
Noise level ___ db		83		Std	79					SE						SW					W				W
Fire Prt. (Water (CO, (Halo (Dry		W	WC	W	W	W		W	W	M	M	M	M	M	M	M	M				W				W
Bus (Flexible (Pipe, (Rigid		F	F	F	F	F	R	Str	F	PN	P	PN	PN	R	F	PF	P	F	F	F	P	P	F	R	PR
Structure (Pipe, (Angles, (Channels		AC	A	A	AC	A	AC	AC	C	A	C			AC	AC	AC	1Bm	AC	AC	AC	PA	A	AC	AC	A
Pressure relays			●	●	●	●		●		●	●	●	●					●					●		●
Ltng prot (Shunts, (Ind each	M	M	G	G		M	GM	Std W	M	G	G			M	MG	G	MG	G	M	MG	MG	M	M	G	G
Ltng on on (Thirteen, (Omitted	T	T		T	T	T	T	T	T	T	T	O	O	O	T	T	T	T	T	T	T	T	T	T	O
Lighting																									
Cont room, (Clsve ltg (Lbn ceiling		L	L	L	L		L	Semi	L	L	*	L	L	L	L	L		CL			L	L		L	L
Vert panel (Ind, ltg (Clark lamn							I			I		L	L		I						C			C	
Foot candles, (Units (Volts (Bi				120/-/-			BL/30/30	30/15/5		20-70	30-40	50/40/30	50/40/30		50/30/25		30/50/-				15			100	50
Genl stn ltg (Recess (Floor		I	I	IF	I	I	I	I	I	IF	I	IF	IF		IF	I	I	I	I	I	IF	F		IF	I
Ltg patterns evasion, no fluorescent		●			●	●	●			●	●			●	Flat		●	●			●			●	●
Emerg ltg from centr battery		●	●	Em G	●		●	Sep B		●	●	●	●		●	●		●	●	●	●	●		●	Sep B
Oil units flood-lighted			●	●	■		●			●	●														

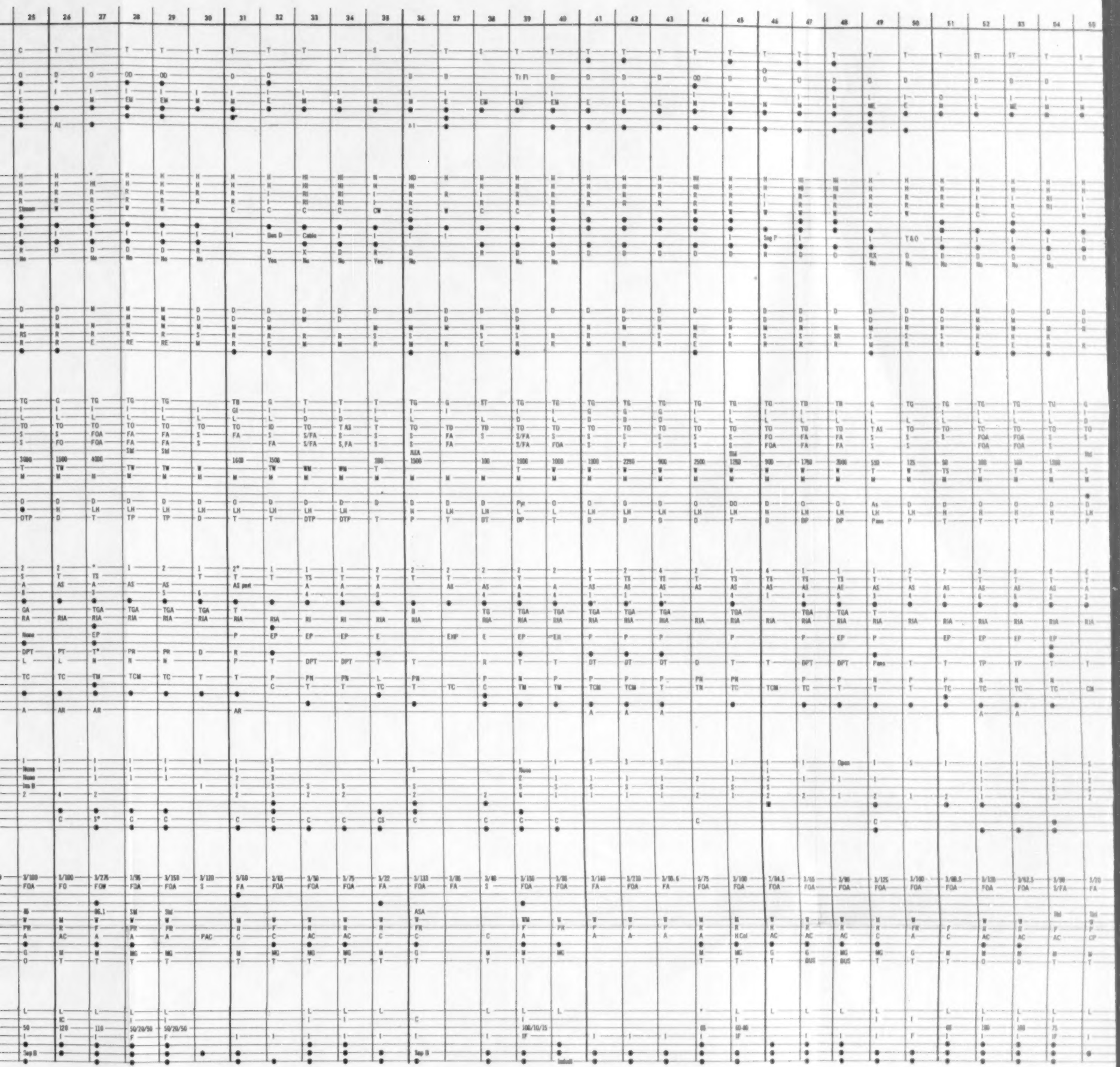
Key to Identification of Plants

No.	Utility	Plant Name
1	Connecticut Light & Power Co	Devon (No. 7)
2	The Hartford Elec Lt Co	Middletown
3	New England Power Co.	Somerset
4	Pennsylvania Power & Light Co.	Martins Creek (No. 1)
5	Scranton Electric Co	Stanton
6	Central Hudson Gas & Elec Corp	Danskammer Point (No. 2)
7	Atlantic City Electric Co.	Deepwater (No. 6)
8	Duquesne Light Co	Phillips (No. 4)
9	Pennsylvania Electric Co	Shawville
10	Long Island Lighting Co	Edward F. Barrett
11	Niagara Mohawk Power Corp	Albany
12	Public Service Electric & Gas Co (N.J.)	Kearney
13	Public Service Electric & Gas Co (N.J.)	Burlington
14	South Carolina Generating Co	Urquhart
15	Florida Power Corp	Turner
16	Cons Gas Elec Lt & Pwr Co of Balto	Herbert A. Wagner
17	Cons Gas Elec Lt & Pwr Co of Balto	Riverside Station (No. 7)
18	Virginia Electric & Power Co	Portsmouth
19	Indianapolis Power & Light Co	White River (Nos. 4 & 5)
20	Indianapolis Power & Light Co	White River (No. 4)
21	Wisconsin Electric Power Co	Oak Creek (No. 2)
22	Southern Indiana Gas & Electric Co	F. Bayard Culley
23	Dairyland Power Cooperative	Alma
24	Cincinnati & Southern Ohio Electric Co	Picway
25	Commonwealth Edison Co	Will County (No. 0)
26	Cincinnati Gas & Electric Co	Walter C. Beckjord
27	Cleveland Electric Illuminating Co	Eastlake (No. 4)
28	Alabama Power Co	Gorgas (No. 8)
29	Alabama Power Co	Barry
30	Kentucky Utilities	E. W. Brown
31	Louisville Gas & Electric Co	Cane Run
32	The Kansas Power & Light Co	Lawrence
33	Iowa Power & Light Co	Council Bluffs
34	Iowa Power & Light Co	Des Moines (No. 2)
35	Black Hills Power & Light Co	Ben Chosen
36	Northern States Power Co	High Bridge
37	Nebraska Public Power System	Plant "X"
38	Iowa Electric Light & Power Co	Sutherland at Marshalltown
39	Union Electric Co of Missouri	Meramec
40	Kansas Gas & Electric Co	Murray Gill
41	Texas Electric Service Co	Eagle Mountain (No. 1)
42	Texas Electric Service Co	Eagle Mountain (No. 2)
43	Texas Electric Service Co	Morgan Creek (No. 4)
44	Houston Lighting & Power	Sam Bertron
45	Dallas Power & Light Co	Parkdale
46	San Antonio City Public Service Board	North Side (No. 1)
47	Texas Power & Light Co	River Crest
48	Texas Power & Light Co	Collin
49	Oklahoma Gas & Electric Co	Mustang (No. 3)
50	New Orleans Public Service, Inc	A. B. Paterson (No. 4)
51	Public Service Co of Oklahoma	Southwestern (No. 7)
52	Southwestern Public Service Co	Plant "X" (No. 3)
53	Southwestern Public Service Co	Moore County
54	Central Power & Light Co	Lon C. Hill
55	City of Colorado Springs	George G. Birdsall
56	Public Service Co of New Mexico	Person
57	City of Glendale	Glendale
58	City of Burbank Public Service Dept	Burbank (No. 4)
59	California Electric Power Co	Highgrove
60	Pasadena Light & Power Dept	Broadway
61	So California Edison Co	Etiwanda
62	Los Angeles Dept of Water & Power	Valley
63	Pacific Gas & Electric Co	Humboldt Bay
64	Pacific Gas & Electric Co	Pittsburg
65	Pacific Gas & Electric Co	Moro Bay

Abbreviatio

●	Yes
Adj	Adjacent to
Al	Alarm
As	Ashcrof
Attmay	Attemperatin
Auto	Automatic
Aux B	Auxiliary bus
Blk	Block
Blr R	Boiler room
Bus D	Bus duct
C Blk	Concrete block
CP	Concrete and plastic
C Tow	Cooling tower
C Wat	Circulating water
City W	City Water
Com	Common spare
Cu Rd	Copper ground rod
Cyc	Cyclone
Em G	Emergency generato
Furn	Furnace
Fut	Future
Gal	Galbestos
Gas Trb	Gas prlnt
Gen	Gamble
H Cel	H Celotex
H Wat	Heated water
H Wel	Inslucd
Ind W	Ind wate
I Ste	I Steam
Ins B	Insulated bus
In D	Intake channel
Indivdl	Individual (Lg
In Stl	Insulated steel
Navy	Neoprene
Out	
Part	
Pnd	
Pyr	
R W	
Rock	
Refl	
Seg	
Semi	
Sep	
Shd	
Std	
Stk	
Str	
Tr F	
T &	
Tnh	
Twn	
U T	

t–Design Characteristics Covering 65 New Power Plants in t



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Out	Outside
Part	Partial
Ped	Pedestal
Pyr	Pyramid
R Wat	River Water
Recl	Reciprocating
Roll	Roller or rolled
Seg P	Segregated phase
Semi	Semi-direct
Sep B	Separate battery
Shd W	Shield wire
Std	Standard
Stk	Stoker
Str	Strain
Tr Fl	Triple Flow
T & O	Transite and open
Tub	Tubular
Turb D	Turbine deck
U Vee	Unloading tower

Plant No.	Item	Note
2	P/Hng (L)ocs, (G)enby, (E)arthmoving	Boom conveyor 180° swing, +18° and −10° vertical swing
2	Plastic pipe for circulation of chemicals	Circulating water piping cement lined
4	P/Hng tied to (C)oppw, (S)teel grd mesh	Strap iron in yard tied to connecting conduit
5, 8	Single conveyor to stockpile or bunkers	Single belt to stockpile, two belts to bunkers
6	Lubr pump drive (E)lec, (M)ech	Aux lubr pump electric, main pump mech
6	Spare exciter (M)otor driv, (N)one	Emerg ac supply from 480-v bus, double electronic rectifier
5	Cable (P)olyeth pvc (M)in ins (L)ead sheath (N)on-metal sheath	Also rubber insulated, neoprene jacket
7	Economizer pH at	pH at 3 when feeding caustic to maintain pH of 10.5 in drum
7	Steam for reheat (T)empers heater air	Steam heat to temper heater air
8	Hydro cyl OD for safety	Hydrogen cylinders indoors in special ventilated room
9	Res source for off (G)en bus (T)ncon bus	Emergency diesel generator
11	Neut grd (R), (X), (D)elt tnf	Generator grounded through station auxiliary transformer
11	Contr room, (C)ove ltg (L)ow ceiling	Recessed troffers and indirect
12, 13	Steam for reheat (T)empers heater air	Bleed steam tempers heater air
12, 13	Fan couplings (H)ydr, (E)lec, (M)ech	BF pump coupling is hydraulic
12	Flow (O)pposed, (P)arallel	Triple flow in LP turbine, valve chests separate in front
13	Flow (O)pposed, (D)ouble	Triple flow in LP turbine, valve chests separate at sides
15	Aux cable in (D)uct (T)ray (P)ipe	Plug-in bus duct for station LV power distribution
16	Intercept valve in reheat (Yes No)	Flapper type emergency check valves in each reheat branch to turbine
18	Res source tnf off (G)en bus (T)ncon bus	Incoming line
18	Contr contr serves (1) (2) (3) units	Control of 2 boilers centralized
21	Contr contr serves (1) (2) (3) units	Separate control centers for Boiler, Turbine, and Generator
26	Valve chest at middle	One middle, one side

Explanatory Notes

Plant No.	Item	Note
27	Stat or cooling (H)ydr, (D)ucts, (C)oters	Hydrogen in gap and oil in hollow conductor
27	Contr contr serves (1) (2) (3) units	All electric control and relay boards visible to operator. All electric controls unitized
27	Contr cables in (D)uct (P)ipe (R)ack (T)ray	No buried pipes or conduits
27	P/Hng tied to (C)oppw, (S)teel grd mesh	All grounds overhead and welded
31	Layout (C)onventional (H)orizontal	High level station. Basement floor 44-ft above normal river level. Vert circulating pumps have 100-ft shafts to accommodate 60-ft possible river level variation
31	P/Hs treated for (W)ood-blow, (S)oaked	Boiling agent in water spray to control dust in pulverizing and crusher houses
31	Boiler (O)utdoor, (S)emi-outdoor	Combination radiation and convection superheater, completely drainable
31	Deaeration in (H)eater, (C)ond,	Demineralizer on condensate bypass from hot well to control silica concentration
31	Contr contr serves (1) (2) (3) units	Electrical control house for generator and switchyard in a separate building
31	Quick start provisions	Thermocouples installed in main flanges, in a few bolts, and in steam chest
37	Fan couplings (H)ydr, (E)lec, (M)ech	BF pump coupling is hydraulic
39	Layout (C)onventional, (H)orizontal	Plant set high for structural purposes because of large fluctuation in river stage
39	Set low for siphon spw	Syphon too great at low river stages and circ water discharge is throttled
39	Steam for reheat (T)empers heater air	Bleed steam tempers heater air
41, 42, 43	Instruments grouped functionally	Graphic panel
44	Contr room, (C)ove ltg (L)ow ceiling	Control room ceiling floor-egg crate from ceiling
49	FW solids held to — ppm; ph — / —	FW conductivity one microhm or less
49	Bunker capacity = 7 hrs operation	Standby fuel (light diesel oil) stored in quantity to give 24 hrs of full-load operation
50	Layout (C)onventional, (H)orizontal	Semi-outdoor construction, enclosed firing aisle, turbine enclosure with removable hatches
52, 53	Cond (D)D, serves as Turb (F)oundation	Cooling water makeup & treatment controlled

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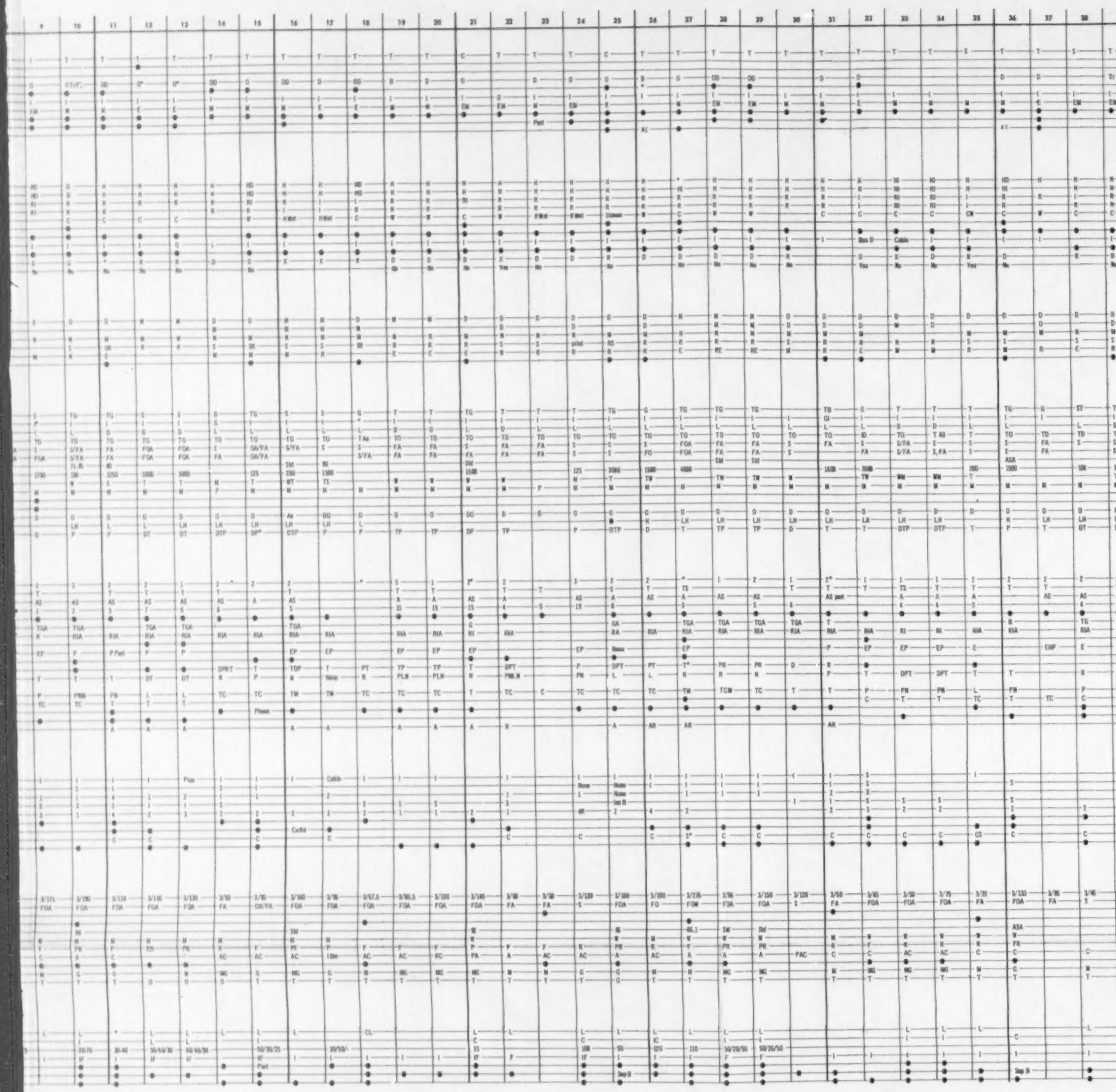
Third Steam Station Check Chart—Design Characteristics Cov



ion of Plants

No.	Utility	Plant Name
34	Iowa Power & Light Co	Des Moines (No. 2)
35	Black Hills Power & Light Co	Hot Springs
36	Northern States Power Co	High Bridge
37	Nebraska Public Power System	Plant "A"
38	Iowa Electric Light & Power Co	Sutherland at Marshalltown
39	Union Electric Co of Missouri	Meramec
40	Kansas Gas & Electric Co	Murray Gill
41	Texas Electric Service Co	Eagle Mountain (No. 1)
42	Texas Electric Service Co	Eagle Mountain (No. 2)
43	Texas Electric Service Co	Wiggin Creek (No. 4)
44	Houston Lighting & Power	San Bernard
45	Dallas Power & Light Co	Parkdale
46	San Antonio City Public Service Board	North Side (No. 1)
47	Texas Power & Light Co	Nueces Coast
48	Texas Power & Light Co	Collin
49	Oklahoma Gas & Electric Co	Mustang (No. 3)
50	New Orleans Public Service, Inc	A. B. Paterson (No. 4)
51	Public Service Co of Oklahoma	Southwestern (No. 2)
52	Southwestern Public Service Co	Plant "X" (No. 3)
53	Southwestern Public Service Co	Moore County
54	Central Power & Light Co	Lon C. Hill
55	City of Colorado Springs	George G. Birdsall
56	Public Service Co of New Mexico	Person
57	City of Glendale	Glendale
58	City of Burbank Public Service Dept	Burbank (No. 4)
59	California Electric Power Co	Highgrove
60	Pasadena Light & Power Dept	Broadway
61	So California Edison Co	Etiwanda
62	Los Angeles Dept of Water & Power	Valley
63	Pacific Gas & Electric Co	Humboldt Bay
64	Pacific Gas & Electric Co	Pittsburg
65	Pacific Gas & Electric Co	Morro Bay

Abbreviations

●	Yes
Adj	Adjacent to
Al	Alarm
As	Ashcroft
Atmosp	Atmospheric
Auto	Automatic
Aux B	Auxiliary bus
Blk	Block
Blr R	Boiler room
Bus D	Bus duct
C Blk	Concrete block
CP	Concrete and plastic
C Tow	Cooling tower
C Wat	Circulating water
City W	City Water
Com	Common spare
Cu Rd	Copper ground rod
Cyc	Cyclone
Em G	Emergency generator
Furn	Furnace
Fut	Future
Gal	Gallonsize
Gas Pit	Gas pilot
Gun	Gunite
H Col	H Column
H Wat	Harbor water
H Wel	Hotwell
Hot W	Hot water
I Bm	I Beam
Ins D	Insulated bus
In C	Intake channel
Individ	Individual (Lg)
In Stl	Insulated steel
Neop	Neoprene
Out	Outside
Port	Portlet
Ped	Pedestal
Pyr	Pyranol
R Wat	River Water
Recip	Reciprocating
Roll	Roller or rolled
Seg P	Segregated phase
Semi	Semi-direct
Sep B	Separate battery
Shd W	Shield wire
Std	Standard
Stk	Stoker
Str	Strain
Tr Fl	Triple Flow
T & D	Transite and epon
Tub	Tubular
Tush D	Turbine deck
U Tow	Unloading tower

Plant No.	Uses
2	Piling (L)arge, (S)mall, (E)arthmoving
2	Plastic pipe for circulation of chemicals
4	Piling tied to (C)apper, (S)teel grd mesh
5, 8	Single conveyor to stockpile or bunkers
9	Lube pump drive (E)lec, (M)ech
5	Spare exciter (M)otor driv, (T)urbine
5	Cable (P)olyeth pvc (M)in mn (L)ead sheath (N)on-metal sheath
7	Economizer pit at
7	Steam for reheat (T)empers heater air
8	Hydro cyl OD for safety
9	Bus source bd off (G)en bus (T)ransm bus
11	Metal grd (R), (X), (D)ia bd
11	Condr room, (C)ove flg (L)ow ceiling
12, 13	Steam for reheat (T)empers heater air
12, 13	Pipe couplings (H)ydr, (E)lec, (M)ech
12	Flow (O)pposed, (D)ouble
13	Flow (O)pposed, (D)ouble
15	Aux cable in (D)uct (T)ray (P)ipe
15	Intercept valve in reheat (Yes (No)
18	Bus source bd off (G)en bus (T)ransm bus
18	Condr condr serves (1) (2) (3) units
21	Condr condr serves (1) (2) (3) units
25	Valve closet at middle

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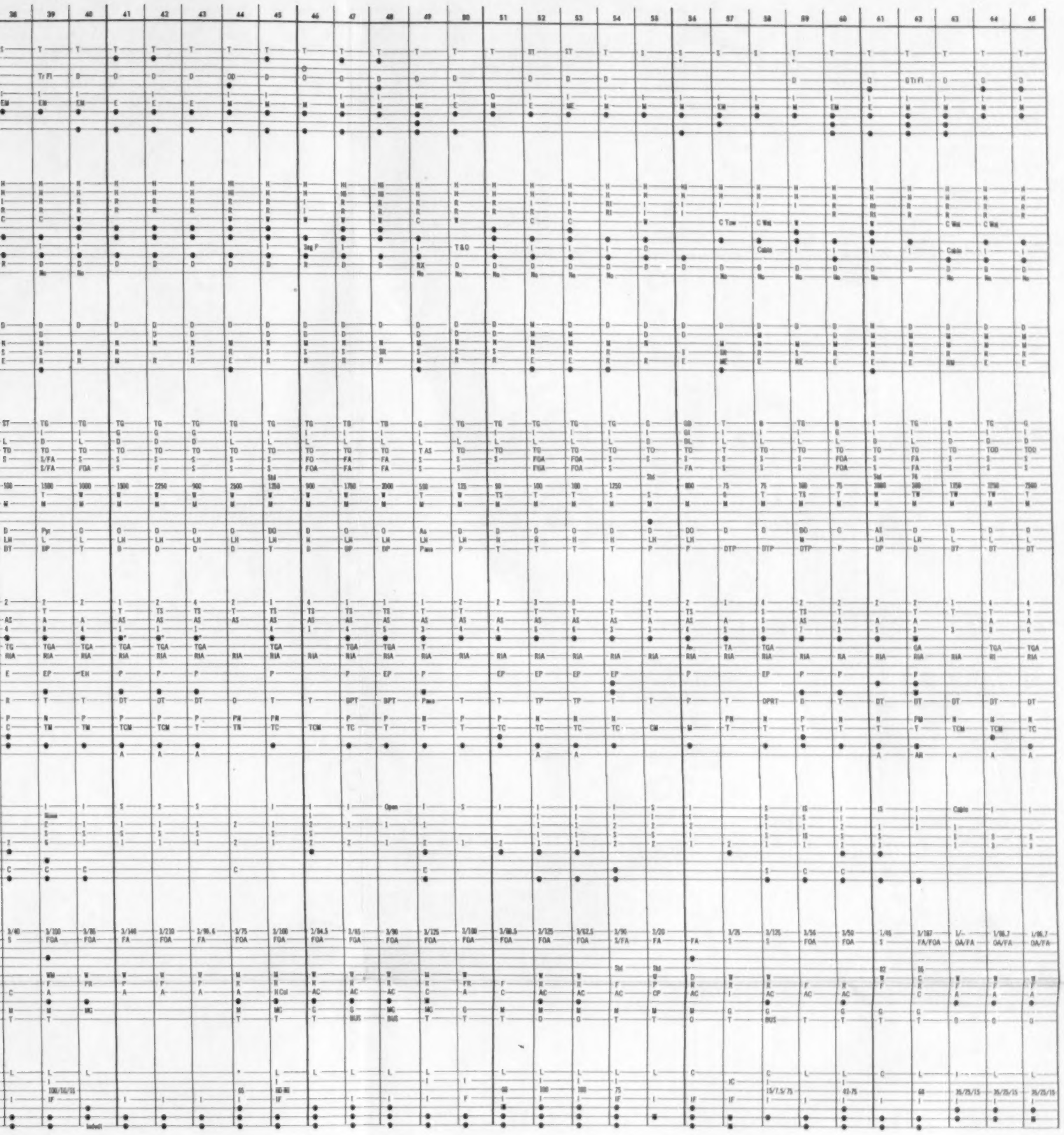
Covering 65 New Power Plants in the United States



Explanatory Notes

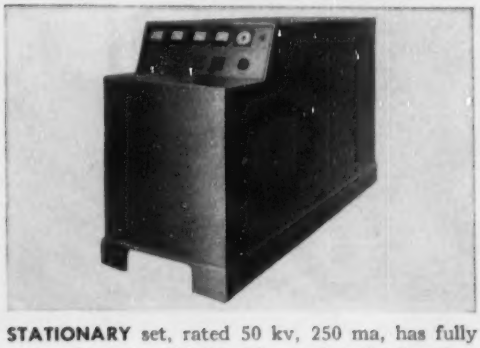
Note	Plant No.	Item	Note
Boom conveyor 180° swing, +10° and −10° vertical swing	27	Stat or cooling (H)ydr, (D)ucts, (I)nters	Hydrogen in gap and oil in hollow conductor
Circulating water piping can-cast lined	27	Contr contr serves (1) (2) (3) units	All electric control and relay boards visible in operation. All electric controls sectional
Strap iron in yard tied to connecting conduit	27	Contr cables in (D)uct (P)ipe (R)ack (T)ray	No buried pipes or conduits
Single bell to stockpile, two bells to bunkers	27	Piling tied to (C)opper, (S)teel gd mesh	All grounds overhead and welded
Aux tdr pump electric, main pump mech	31	Layout (C)onventional (H)orizontal	High level station, Basement floor 44-ft above normal river level. Vert circulating pumps have 100-ft shafts to accommodate 68-ft minimum river level variation
Emerg ac supply from 480-v bus, double electronic rectifier			
Also rubber insulated, Neoprene jacket			
pH at 3 when feeding caustic to maintain pH of 10.5 in drum	31	Pile treated for (W)ood-blow, (S)ealed	Wetting agent in water spray to control dust in unloading and crusher houses
Blower feed to temper heater air	31	Boiler (O)utdoor, (S)emi-outdoor	Combination radiation and convection superheater, completely drainable
Hydrogen cylinders indoors in special ventilated room	31	Deaeration in (H)eavil, (C)oil,	Demineralizer on condensate bypass from hot-well to control silica concentration
Emergency diesel generator	31	Contr contr serves (1) (2) (3) units	Electrical control house for generator and switchyard in a separate building
Generator grounded through station auxiliary transformer	31	Quick start provisions	Thermocouples installed in main flange, in a few bolts, and in steam chest
Recovered boilers are reserve			
Bleed steam tempers heater air	37	Fan couplings (H)ydr, (E)lec, (M)ech	BF pump coupling is hydraulic
BF pump coupling is hydraulic	39	Layout (C)onventional, (H)orizontal	Plant set high for structural purposes because of large fluctuation in river stage
Triple flow in LP turbine, valve cleats separate at inlet	39	Set low for siphon oper	Syphon too great at low river stages and circ water discharge is throttled
Triple flow in LP turbine, valve cleats separate at inlets	39	Steam for reheat (T)empers heater air	Bleed steam tempers heater air
Plug-in bus duct for station LV power distribution	41, 42, 43	Instruments grouped functionally	Graphic panel
Flapper type emergency check valves in each reheat branch to turbine	44	Comb room, (C)ove itg (L)ow ceiling	Control room ceiling flow-egg crate from ceiling
Incoming line	49	FW solids held to — ppm; pH — / —	FW conductivity one microhm or less
Control of 2 boilers centralized	49	Bunker capacity = ? hrs operation	Standby fuel (light diesel oil) stored in quantity to give 24 hrs of full-load operation
Separate control centers for Boiler, Turbine, and Generator	50	Layout (C)onventional, (H)orizontal	Semi-outdoor construction, enclosed firing aisle, turbine enclosure with removable hatches
One middle, one side	52, 53	Cond (O)D, serves as Turb (F)oundation	Cooling water makeup & treatment controlled

Plant No.	Item	Note
55	Side-outlet exhausts	automatically from condenser loading Double V type turbine hoodsteve allows condensate to be positioned parallel to turbine
57	Bunker capacity = ? hrs operation	Oil stored in concrete reservoirs beneath each cooling tower
57	Deaerating FW htr (O)pen, (C)losed	FW heaters all contact type. Pressure 178 psia
57	Cooling (T)ower, (I)nduced, (F)orced draft	Circulating water piping in walk-thru tunnel to towers
57	Cond (O)D, serves as Turb (F)oundation	Spring supported, earthquake braced
57	Vertical condensate pumps	Two FW htr drain pumps per heater
57	Insul. of HT pipe (M)ineral, (A)lum shield	Galvanized jacket over insulation
59	Side-outlet exhausts	Side mounted condenser
62	Steam temperature (Reheat 1)	Fw limits 3 and 4 very
62	FW solids held to — ppm; pH — / —	MU solids held to 2 ppm; pH 7.5/8.5
65	Cath prot fw buried pipe	Fuel oil line from ocean anchorage is cathodic protected

PORTABLE test set has four wheels, equipped with roller bearings for smooth, easy handling.

GENERAL ELECTRIC'S D-C CABLE-TESTING SET IS SAFER, MORE ECONOMICAL

MOBILE set is mounted in a road trailer. The versatility of this equipment can be greatly increased by the addition of a fault-locating set.



STATIONARY set, rated 50 kv, 250 ma, has fully enclosed housing. It is ideal for a substation location.

To help protect the operator, General Electric's 50-kv d-c cable-testing set is fully enclosed—has an all-steel, dead-front panel. The high-voltage terminal for connecting to the cable is located at the rear of the cabinet, far from the operator, where it can easily be protected from accidental contact. Each set is provided with a discharge switch to automatically ground both the set and the cable under test when the set is de-energized.

It is economical to use a d-c set for installation acceptance and periodic cable tests, because of the low charging currents required, thus keeping the demand on station auxiliary power to a minimum. For this 50-kv set, the 230-volt power demand is only about 3 to 4 kw. Furthermore, because it is available in either 100 ma or 250 ma capacities, this same set is effective for fault reduction.

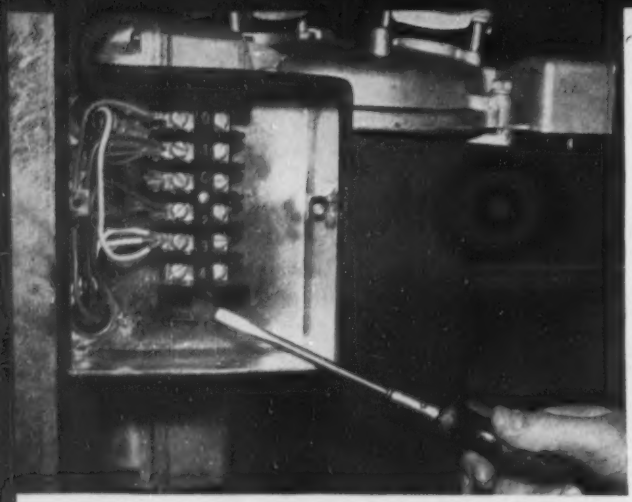
More and more utilities are finding G-E testing sets the ideal method for checking the condition of their cables. A simple comparison of the leakage current measured during periodic tests with that obtained during the original acceptance tests tells the story.

Available in stationary, portable or mobile models, this set has many features which contribute to its safe, economical operation. For more information about the 50-kv set or other G-E cable-testing units in ratings of 75 to 375 kv contact your nearest G-E Apparatus sales office or write for Bulletin GEA-4595. Address General Electric Company, Section 422-18, Schenectady 5, New York.

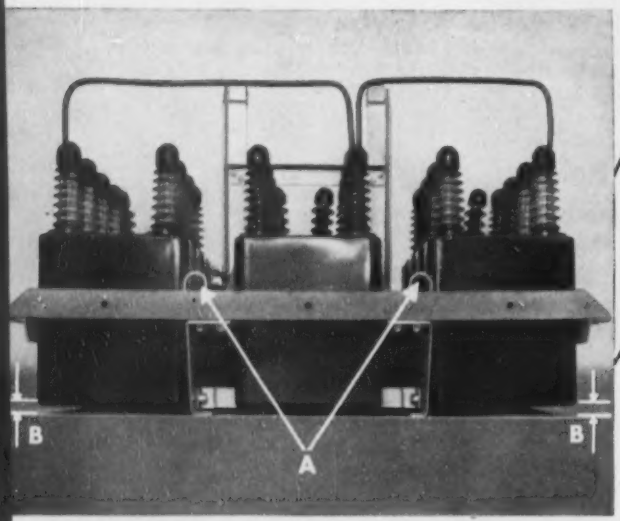
Progress Is Our Most Important Product

GENERAL ELECTRIC

You'll find all

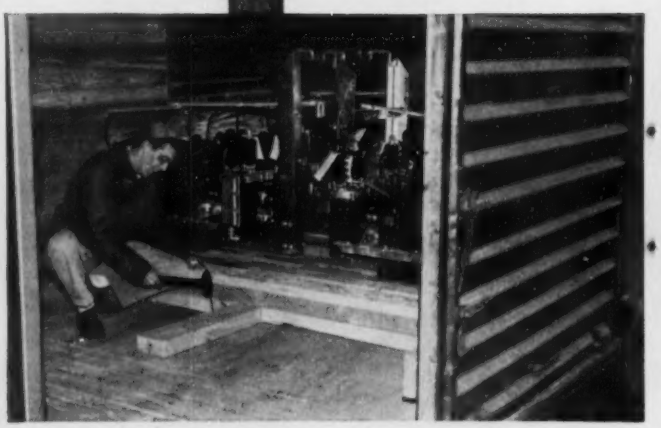


ROOMY TERMINAL BOX, easily accessible, allows plenty of working space for making connections to numbered, clamp-type terminals. Two 1-inch knockouts in bottom provide openings for leads.



FOUR LIFTING EYES, two in front (a) and two in rear, eliminate need for spreader bar; equipment lifts level for easy mounting on pole. Skids provide clearance (b) to prevent scraping bottom of units.

HEX-HEAD CAP SCREWS secure switches and units to frame and simplify removal for maintenance. Three units can be substituted for the switches, making a 375-kvar fixed bank.



SHIPPED ASSEMBLED, in carload shipments, ready to hoist into position upon arriving at the pole. All that needs to be removed is the pallet which is attached with four bolts.

the features you want in new G-E Auto-switch Capacitors

New design helps to simplify installation, speed maintenance; and gives you increased flexibility, more economical service

Based on the suggestions of electric utilities, actual field experience and G-E studies, here are the features you'll need to make your auto-switch capacitor installations easier, increase their flexibility and reliability and cut maintenance problems:

FOR EASY INSTALLATION we've provided skids to protect units from damage, simplify and speed handling; four lifting eyes to facilitate hoisting; ample terminal box with knockouts to simplify control connections; holes for mounting auxiliary equipment, such as lightning arresters, directly on the equipment; and grounding terminals on either side of the frame.

FOR FLEXIBILITY and low maintenance we've included: tapped mounting holes to make it easier to replace switches and units; arranged mounting so that additional capacitors can be substituted for switches, potential transformer or arresters can be mounted on racks and shipped as part of equipment, and so that capacitors and single-phase switches of all major manufacturers can be used interchangeably. In addition we've made the new equipment reconnectable from delta to wye, using the same cable; and made possible the mounting of a single equipment, direct-to-pole, or two equipments side-by-side on the same crossarm.

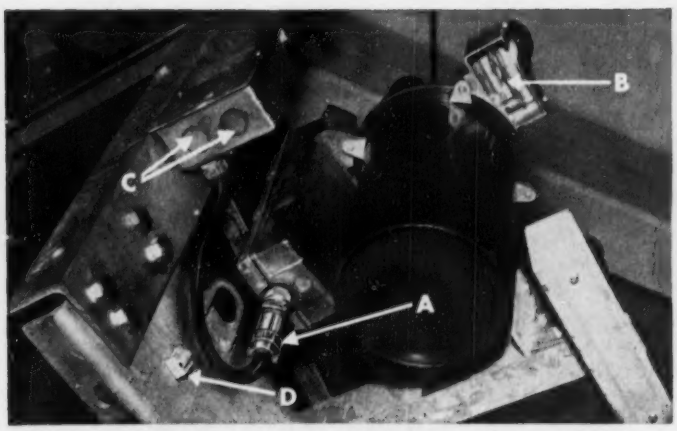
FOR MAXIMUM RELIABILITY we've standardized on capacitors filled with Universal Pyranol* dielectric; heavy-gage hot-dipped galvanized racks to help avoid handling damage, distortion, and minimize corrosion; 5-kv Flamenol* insulated cables and rubber bird caps; and uniform striking distance between bushings of different potential.

This is only a partial listing of the user-convenience features of G-E Auto-switch Capacitors. For complete information, contact your G-E Apparatus Sales Representative. *General Electric Company, Schenectady 5, New York.* 441-12

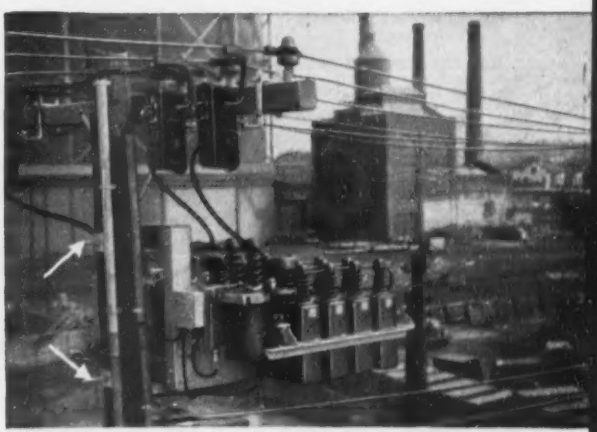
*Reg. Trade-mark of General Electric Co.

Progress is our most important product

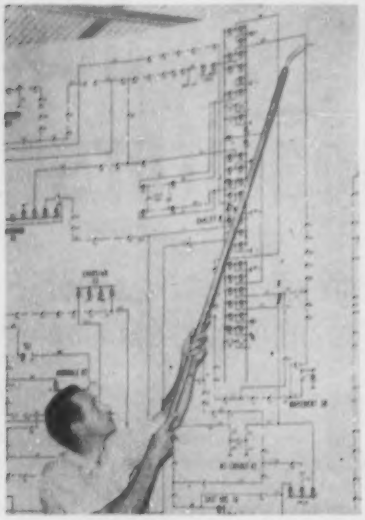
GENERAL ELECTRIC



BOTTOM VIEW shows plug-in connector (a). Manual operating handle (b) on switch is readily accessible. Note two knockouts (c) in terminal box. Ground terminal (d) can be on either side of frame.



DIRECT-TO-POLE MOUNTING, an optional design, with two through-bolts (arrows) eliminates need for extra crossarms and makes possible installations on over-crowded poles.



MAGNETIC SYMBOLS are placed on high parts of board with 1-in. diam maple stick, 5 ft long having wire holder on end

DISPATCHER'S BOARD consists of 15 steel panels, three feet wide and 11 ft high. Fluorescent lighting provides 125 to 150 ft-c on the desk. To give equal light intensity on the vertical surface of the board, glass lenses were placed in louvered ceiling in semi-circle

Cincinnati Gets New Dispatchers' Office

W. T. PAVELY, Supt of System Operation, Cincinnati Gas and Electric Co., Cincinnati, Ohio

Cincinnati Gas & Electric Co power supervisors have a new office of the latest design. Features of the 40 x 42-ft office include excellent lighting and a new board.

Entire ceiling is lighted with fluorescent tubes above white plastic egg crate louvers. Lamps are set end to end and spaced one foot apart.

Lighting intensity at the desk level ranges from 125 to 150 ft-c. In order to get equally good lighting on the vertical surface of the dispatchers board, incandescent units with concave prismatic glass lenses were placed in the louvered ceiling in a semi-circle one foot out from the board.

One unit is adjusted to light up the upper half of the board, the next unit the lower half and so on around the board. As a result, the light intensity on the board is slightly more than 100 ft-c. When these units are cut out, the power supervisor is actually given the impression that the board has moved back 10 to 15 feet. Reflection on the board from the daylight coming in from the windows is practically eliminated.

Power supervisor's board consists of 15 steel panels 3 ft wide by 11 ft high. Panels are bolted together to form a continuous semi-circle with the center in the approximate center of the room. Two desks are located in front of the board, 12 ft out from the center of the arc.

Three of the panels in the middle form a straight line and on the center panel are indicating telemeters giving the megawatt loading for generating stations, all interconnections, and many important transmission circuits. To the right of the desks are graphic instruments giving the load on the three generating stations, frequency, net tie line loading, the ac network and the dc system voltages, outside light intensity, and temperature.

Behind one desk is a teletypewriter connected to a special circuit from the Weather Bureau.

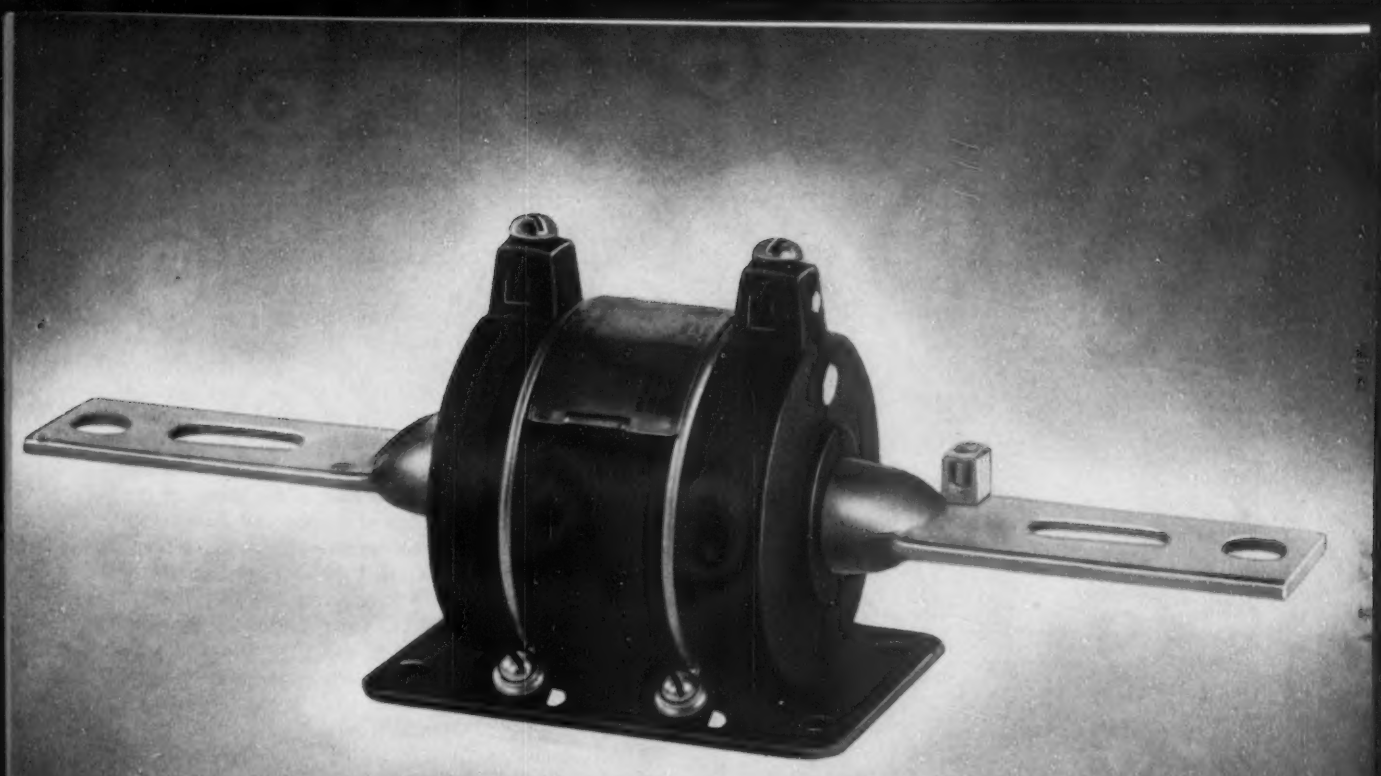
Placed on the surface of the board, using colored acetate fiber tapes, is a single line diagram of the entire system of 13.2 kv and higher. It has as few crossings of lines as possible, so that the diagram can be readily followed. In order to accomplish this, the system diagram has been broken down into voltages; each voltage system is isolated from the others. A different color tape is used for each voltage.

Magnetic buttons of colored plastic are used to show switching. The plastic button consists of two plates, the front plate being $\frac{5}{8}$ in. in diam and the bottom $\frac{3}{4}$ in. with a magnet protruding from the base. Between the top and bottom is a reduced section or neck $\frac{3}{8}$ in. in diam.

In applying the tape to the board, the center of the symbols for circuit breakers, air break switches, and disconnects is made either red or green to indicate the normal position of switch. If any circuit breaker or switch is put in an abnormal position, a magnetic button of the appropriate color is placed on top of the symbol.

Changing magnetic buttons on the high board without using ladders can be readily accomplished with a special stick. The stick is made of 1-in. maple, 5 ft long. On the end of the stick is a non-magnetic wire loop shaped so that the neck of the button can be slipped into the loop. The wire has been covered with tape so as not to mar the finish of the board.

Gummed paper labels are used for letters and numbers on the board. It was found after labels were applied to the lacquered finish on the board and became dry many would drop off. Adding a little glycerine to the water used to moisten labels eliminated this difficulty entirely.



THE NEW G-E MINIATURE TRANSFORMER measures only $3\frac{1}{2}$" long by $3\frac{3}{16}$" wide by $4\frac{1}{16}$" high without bar-primary, and weighs from 2 to $4\frac{1}{2}$ pounds. It is available in ratings of 200 and 400 amperes.

GENERAL ELECTRIC ANNOUNCES . . .

New Butyl-molded Miniature Current Transformer

General Electric's butyl-molded current transformer line has been extended to include a 600-volt miniature. The new Type JCA-0 features complete mounting flexibility. Designed for indoor or outdoor metering applications, the new miniature is available in 200- and 400-ampere ratings in both bar-primary and window-type construction.

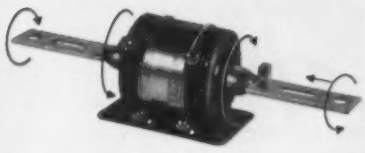
MOUNTING FLEXIBILITY is provided in the Type JCA-0 first by friction-fit primary terminals. These terminals are adjustable within a 360-degree arc and can also be moved lengthwise. Also the removable base plate can be rotated within an arc of 180-degrees in relation to the secondary terminals.

INDOOR OR OUTDOOR APPLICATION is another feature of the Type JCA-0. Because of its butyl-molded construction, this new transformer can be installed either indoors or outdoors, and requires no housing or other protection from the weather.

SIX VARIATIONS of this butyl-molded current transformer are possible. It can be used as a bar-primary-type or window-type, or with or without base plate and an auxiliary mounting plate.

FOR MORE INFORMATION, contact your nearest G-E Apparatus representative, or write for bulletin GEC-1245 to: Section 604-41, General Electric, Schenectady 5, N. Y.

GENERAL ELECTRIC



BAR-PRIMARY-TYPE

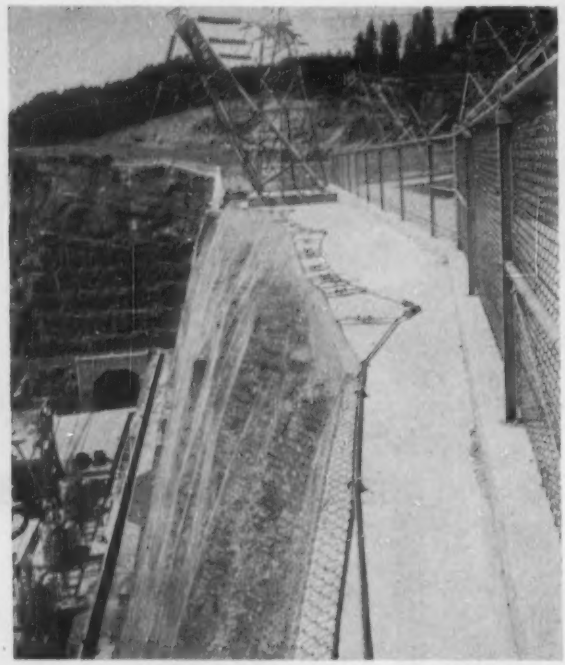
Complete adjustability is available in the new transformer. The primary and secondary terminals may be adjusted and set independently of each other. This flexibility provides mounting in any position.

WINDOW-TYPE

The new Type JCA-0 transformer is also available in a window-type construction for through-type applications. This feature plus the butyl-molded construction facilitates outdoor pole mounting installations.

Mesh Guides Falling Rock; Protects Substation Equipment

W. A. HILL, Structural & Hydraulic Engineer, Washington Water Power Co, Spokane, Wash.



WOVEN WIRE MESH channels falling rock into a gutter at the bottom of the cliff. Catenary cables are held by 1-in. anchor bolts

A protective wire-mesh screen covering the face of a 150-ft high cliff protects substation equipment from falling rocks at Washington Water Power Co's Cabinet Gorge hydro plant.

Two banks of 42,500-kva single-phase transformers on a shelf above the powerhouse run parallel and adjacent to the cliff. Above the transformer deck another shelf extends the full length of the power station and across one end. A concrete slab on this shelf and a 3½-ft curb erected on its outer edge provide a gutter for catching falling rocks. However, experience showed that rocks falling from high up struck lower on the cliff, bounced clear of the gutter, and landed in the transformer bay.

Two other methods of controlling rock fall were vetoed. Rock bolts could not be used because of the nature of the rock. Gunniting to consolidate the entire cliff face would be costly, hazardous, and require considerable down time. It was decided to guide the fall of the rocks into the existing gutter by placing a wire screen over face of cliff.

Rolls of 2-in. mesh, No. 9 wire fencing, measuring 12 x 50 ft, were fastened end to end. The 100-ft lengths were draped over the cliff from catenary cables secured to 1-in. rock anchor bolts spaced 22 to 27 ft apart. Catenary cables are 7/16-in. 7-strand galvanized guy cable. Each length of fencing is fastened to the preceding length by weaving a strand of No. 9 galvanized wire through the adjoining edges. This was done by men suspended in boatswains chairs.

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Circulating Water Piping Installed Under Difficulties

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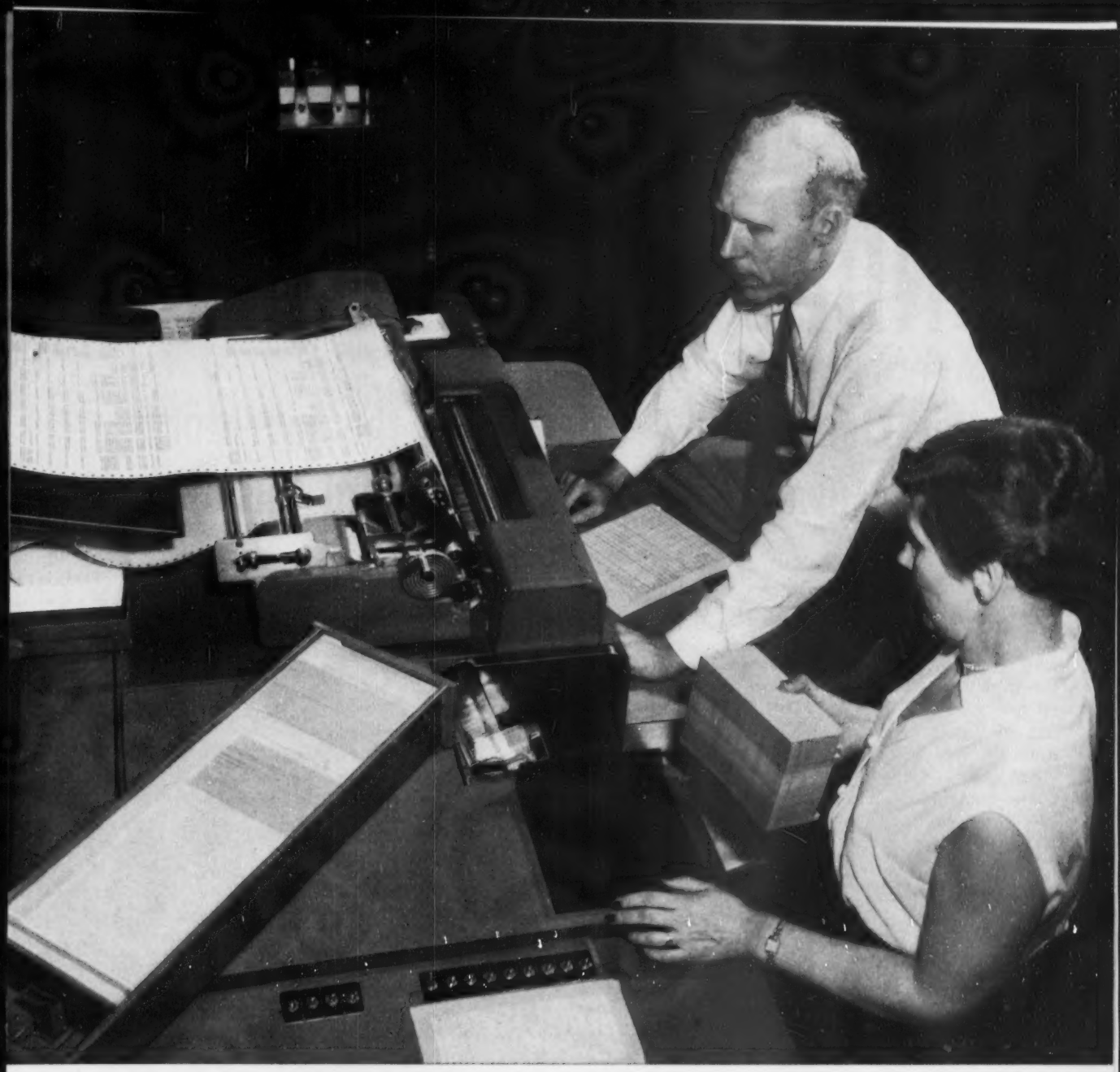
(*Continued on page* 152)

PRECAST CONCRETE ELBOW of 12-ft outside diameter (lower right) is shown before being lowered into position in the cofferdam excavation at the rear center. In the background is the trestle construction for the circulating water conduit installation



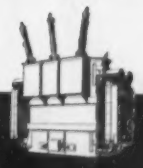
1-HOUR TRANSFORMER DESIGN?

The answer is yes! General Electric's new Card-Programmed Calculator—an IBM mechanical brain—can work out in 60 minutes transformer design problems that formerly took 20 to 40 hours "by hand."

Already, certain designs for customer quotations are being delivered in record time. Eventually, engineers will use the Card-Programmed-Calculator to help design most G-E power transformers. G-E designers are using the hours saved for basic engineering and development work. CPC is just one of the tools G.E. uses to give you faster delivery of improved power transformers. General Electric Company, Schenectady 5, New York. 421-24

Progress Is Our Most Important Product

GENERAL ELECTRIC



Power Transformer NEWS

ANNOUNCING THE NEW G-E
INDUSTRY-STANDARD

General Electric now offers you the inventory-reducing advantages of ASA-standard bushings

Oil circuit breakers, power transformers, voltage regulators, and oil-filled reactors from 23 to 69 kv ordered from General Electric after October 1, 1954 will be equipped with G-E bushings designed in accordance with the new ASA Standards*. From then on, you'll be able to trim your costs by cutting bushing inventories and simplifying ordering and stocking.

ALL PREVIOUS ADVANTAGES RETAINED. Industry-standard bushings made by G.E. retain all the many recognized advantages of G-E bushings such as:

Center clamping to minimize the possibility of porcelain breakage.

Complete sealing to cut maintenance.

Porcelain replacement in the field without removing bushings.

START YOUR STANDARDIZATION PROGRAM RIGHT AWAY by specifying G-E power apparatus—you'll get the new industry-standard bushing. For more information, contact your nearest G-E Apparatus Sales Office or write to General Electric Company, Section 422-21, Schenectady 5, New York.

* The applicable electrical and mechanical standards are C57.12a 1954, C57.12b 1954 and C37.4a 1954.

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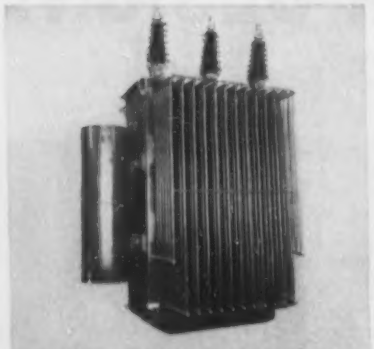
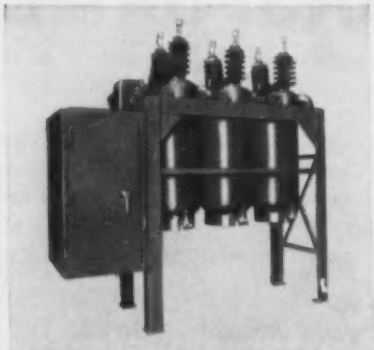
GENERAL ELECTRIC

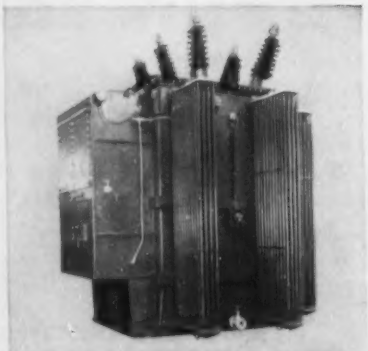
HERE'S WHERE NEW G-E INDUSTRY-STANDARD BUSHINGS WILL BE USED



POWER TRANSFORMERS

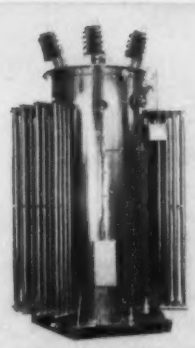


OIL CIRCUIT BREAKERS



REGULATORS

BUSHING



OIL-FILLED REACTORS

The new G-E industry-standard bushing meets requirements of ASA Standards and retains all the advantages of previous General Electric bushings.

Circulating Water

(*Continued from page* 148)

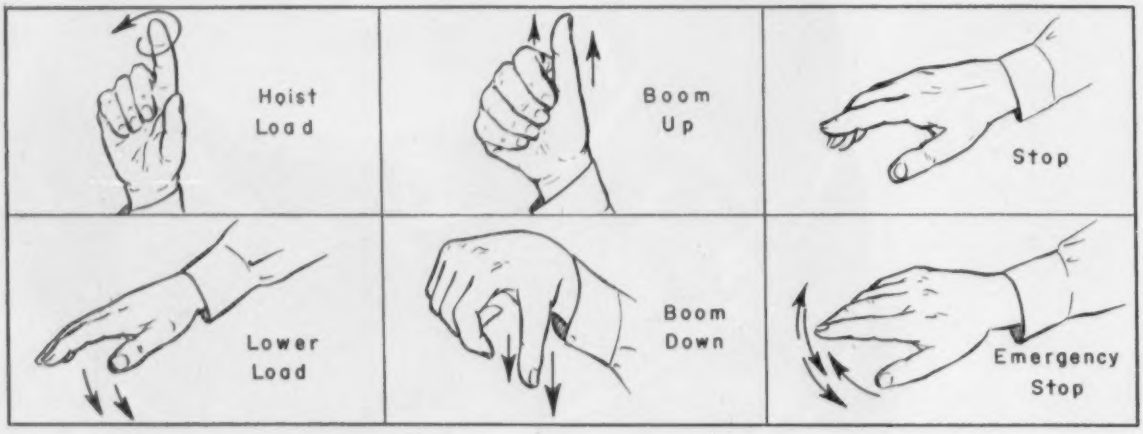
winter storms and high seas.

In order to meet the operating schedule it was necessary to start the elbows and proceed seaward while the screen well was being built. On completing the screen well the 12-ft pipes were installed out to the elbows. The illustration shows the formwork for the precast elbow which was installed about 35 ft below the surface of the beach. Since the elbows weigh about 60 tons each, it was important to provide a simple and yet accurate means for setting them in position, both horizontally and vertically.

A foot was provided on the elbows and the bottom of the excavation made level, so that when the elbow was lowered practically no further leveling was required. The necessity for speed in the operation was enhanced by the fact that the excavation was some 20 ft below water level, and as no well points were used in order to minimize construction costs, the ingress of ground water presented some risk of losing the bottom of the excavation.

It was necessary to have the extreme seaward end of the pipe about 50 ft below the ocean surface to provide the minimum required sand cover and allow sufficient depth of water for installation of vertical intake and outfall structures. Tops of structures had to be 20 ft below water at low tide.

Installation of the structures avoids the entrainment of large quantities of sand moved along the ocean bed by wave action. Outer ends of the intake and discharge pipes are about 300 ft apart to preclude recirculation of circulating water.



Crane Signals Standardized to Reduce Accidents

Northern States Power Co, of Wisconsin, has standardized on hand signals for handling loads with cranes or hoists to eliminate accidents due to faulty or misunderstood signals. This action was necessary because crews from different areas of the company's territory, who use variations of signals, often work together in times of storms and disasters.

Only the following six signals are approved for use:

Hoist load—with forearm vertical and forefinger pointing upward move hand in horizontal circle.

Lower load—with arm extended and palm downward wave hand down and up.

Boom up—with arm partially extended, fingers clenched, and thumb pointing upward move hand up and down.

Boom down—with arm extended, fingers clenched, and thumb pointing down move hand down and up.

Stop—with arm extended and palm downward hold position rigidly.

Emergency stop—with arm extended and palm downward move hand rapidly to right and left.

POLE-MATERIAL TRAILER is designed for capacity of 4,000 lb and with low center of gravity so that trailer will not tilt or sway

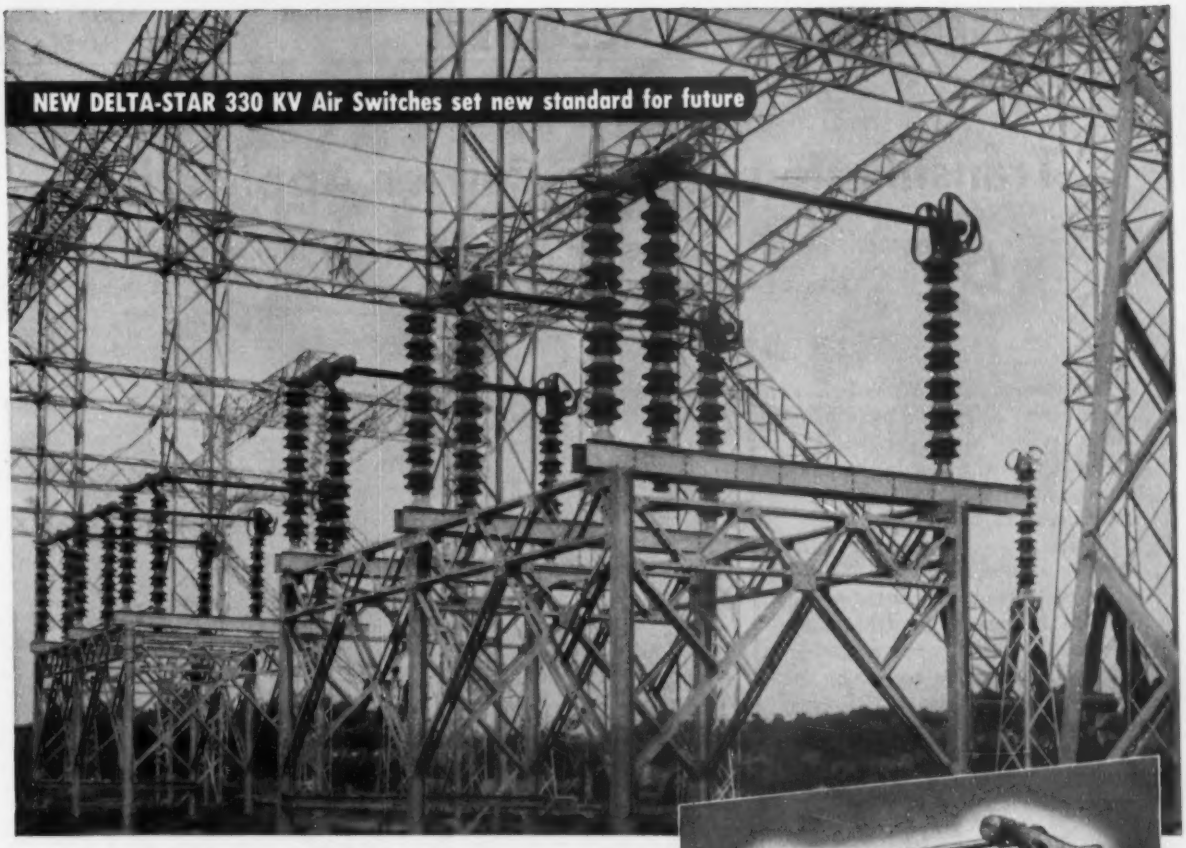
Multi-Purpose Trailer Eliminates Extra Vehicle

F. O. LEWIS, Supervisor of Transportation, Dayton Power & Light Co, Dayton, Ohio

Equipment for overhead line construction crews can be transported much easier with a multi-purpose combination pole and material trailer developed by Dayton Power & Light Co in cooperation with the manufacturer. This trailer eliminates the need of an extra vehicle for hauling poles.

Coupling to the truck can be done by one man, even

(*Continued on page* 156)

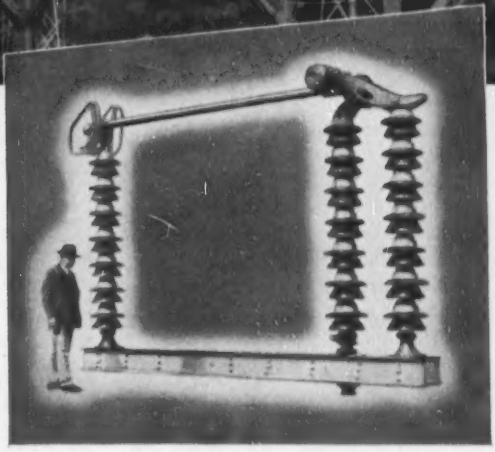


How soon will your future be in this picture?

These new ultra high voltage switches, the first to be ordered and built in this country, are now installed and ready for service. They are the forerunners for handling heavy power loads of the future.

Built along the same basic principles as lower voltage MK-40 switches, which have become the standard of comparison, these 330 kv switches set a new standard for *ultra high voltage* service. They also represent the advantages offered all utilities through DELTA-STAR specialization in carefully engineered, specially designed high voltage switching equipment.

Whether you now need switches of high voltage ratings, high current ratings or normal ratings, your preferred source, more than ever, is DELTA-STAR.



DELTA-STAR 330 kv, 1600 Ampere MK-40 Air Switch

This giant size switch has every feature incorporated in all DELTA-STAR MK-40 switches. Included are rugged high pressure contacts construction and efficiency, simplified blade actuating mechanism, a minimum number of current inter-change surfaces and ease of operation.

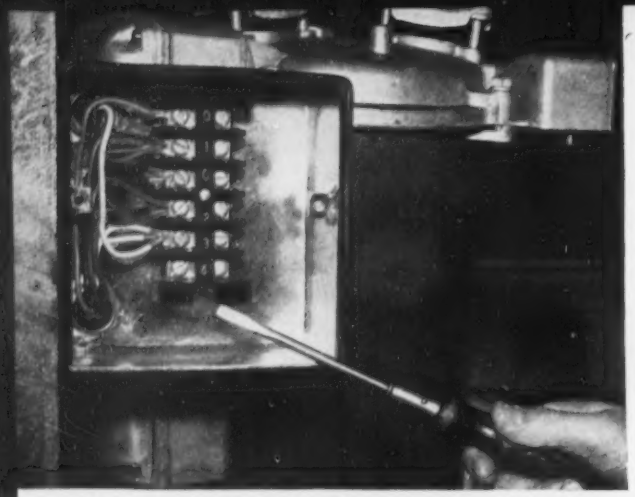
DELTA-STAR MK-40 switches are available in voltage ratings from 7.5 to 330 kv, and current ratings from 400 to 500 amperes.

When you want the best in high voltage switching equipment—specify DELTA-STAR

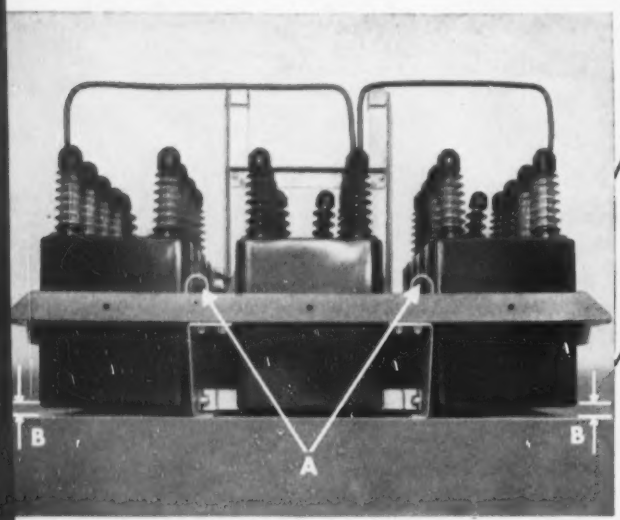
DELTA-STAR ELECTRIC DIVISION

H. K. PORTER COMPANY, INC.
OF PITTSBURGH
2437 Fulton Street • Chicago 12, Illinois
District Offices in Principal Cities

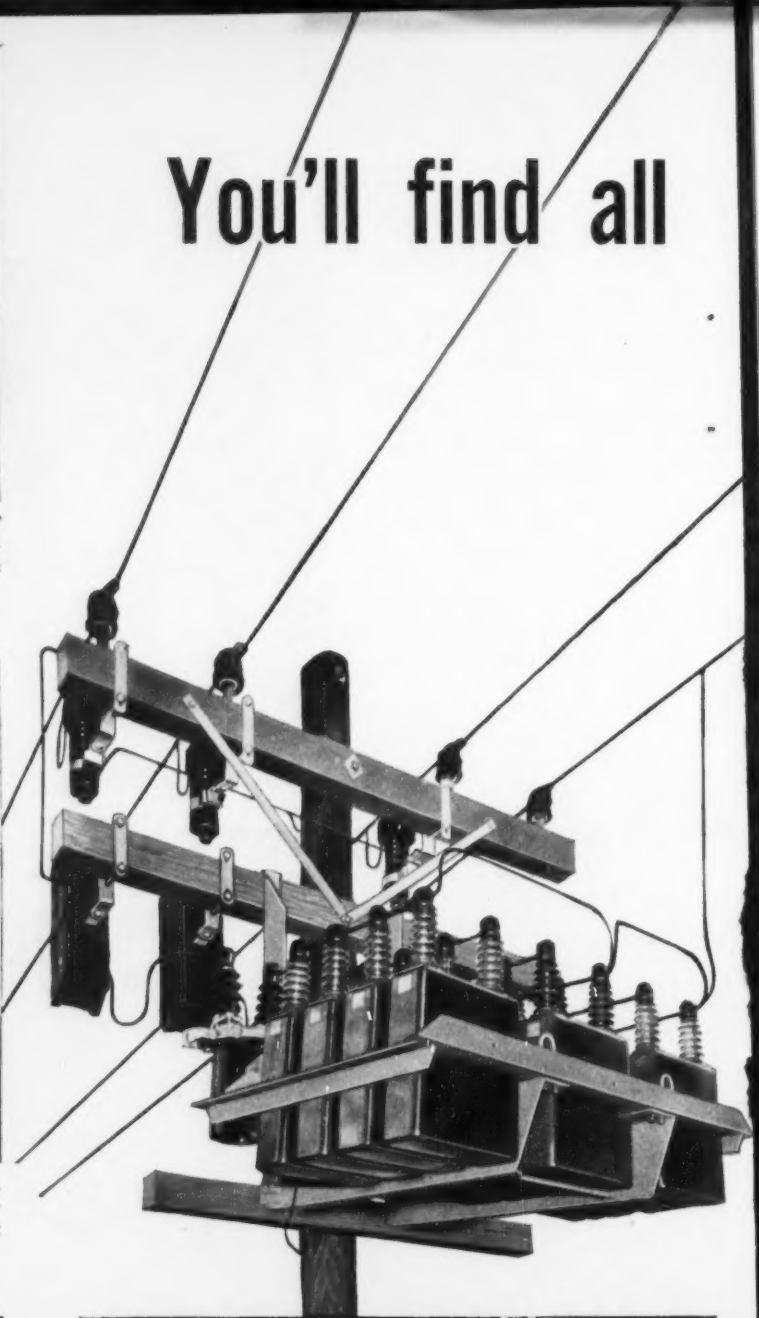
You'll find all



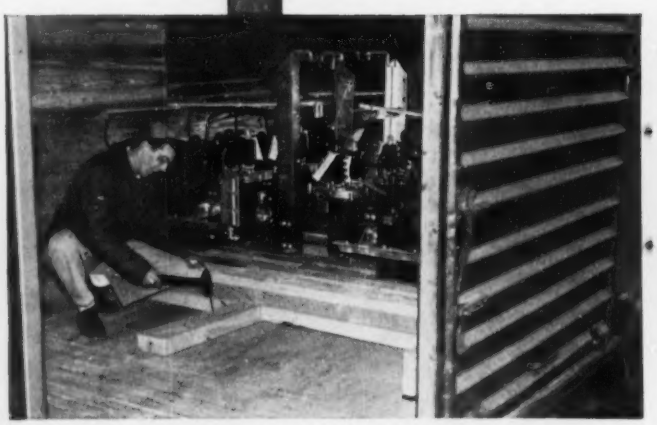
ROOMY TERMINAL BOX, easily accessible, allows plenty of working space for making connections to numbered, clamp-type terminals. Two 1-inch knockouts in bottom provide openings for leads.



FOUR LIFTING EYES, two in front (a) and two in rear, eliminate need for spreader bar; equipment lifts level for easy mounting on pole. Skids provide clearance (b) to prevent scraping bottom of units.



HEX-HEAD CAP SCREWS secure switches and units to frame and simplify removal for maintenance. Three units can be substituted for the switches, making a 375-kvar fixed bank.



SHIPPED ASSEMBLED, in carload shipments, ready to hoist into position upon arriving at the pole. All that needs to be removed is the pallet which is attached with four bolts.

the features you want in new G-E Auto-switch Capacitors

New design helps to simplify installation, speed maintenance; and gives you increased flexibility, more economical service

Based on the suggestions of electric utilities, actual field experience and G-E studies, here are the features you'll need to make your auto-switch capacitor installations easier, increase their flexibility and reliability and cut maintenance problems:

FOR EASY INSTALLATION we've provided skids to protect units from damage, simplify and speed handling; four lifting eyes to facilitate hoisting; ample terminal box with knockouts to simplify control connections; holes for mounting auxiliary equipment, such as lightning arresters, directly on the equipment; and grounding terminals on either side of the frame.

FOR FLEXIBILITY and low maintenance we've included: tapped mounting holes to make it easier to replace switches and units; arranged mounting so that additional capacitors can be substituted for switches, potential transformer or arresters can be mounted on racks and shipped as part of equipment, and so that capacitors and single-phase switches of all major manufacturers can be used interchangeably. In addition we've made the new equipment reconnectable from delta to wye, using the same cable; and made possible the mounting of a single equipment, direct-to-pole, or two equipments side-by-side on the same crossarm.

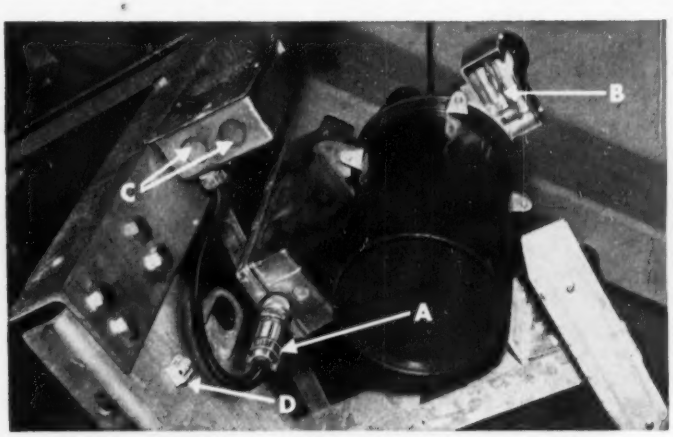
FOR MAXIMUM RELIABILITY we've standardized on capacitors filled with Universal Pyranol* dielectric; heavy-gage hot-dipped galvanized racks to help avoid handling damage, distortion, and minimize corrosion; 5-kv Flamenol* insulated cables and rubber bird caps; and uniform striking distance between bushings of different potential.

This is only a partial listing of the user-convenience features of G-E Auto-switch Capacitors. For complete information, contact your G-E Apparatus Sales Representative. *General Electric Company, Schenectady 5, New York.* 441-12

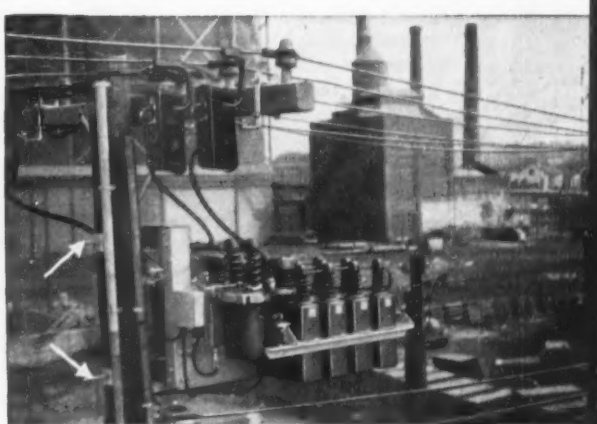
*Reg. Trade-mark of General Electric Co.

Progress is our most important product

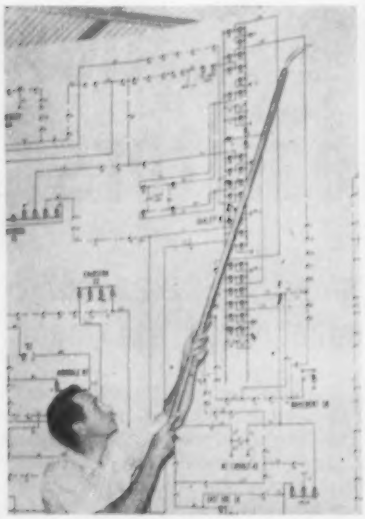
GENERAL ELECTRIC



BOTTOM VIEW shows plug-in connector (a). Manual operating handle (b) on switch is readily accessible. Note two knockouts (c) in terminal box. Ground terminal (d) can be on either side of frame.



DIRECT-TO-POLE MOUNTING, an optional design, with two through-bolts (arrows) eliminates need for extra crossarms and makes possible installations on over-crowded poles.



MAGNETIC SYMBOLS are placed on high parts of board with 1-in. diam maple stick, 5 ft long having wire holder on end

DISPATCHER'S BOARD consists of 15 steel panels, three feet wide and 11 ft high. Fluorescent lighting provides 125 to 150 ft-c on the desk. To give equal light intensity on the vertical surface of the board, glass lenses were placed in louvered ceiling in semi-circle

Cincinnati Gets New Dispatchers' Office

W. T. PAVELY, Supt of System Operation, Cincinnati Gas and Electric Co., Cincinnati, Ohio

Cincinnati Gas & Electric Co power supervisors have a new office of the latest design. Features of the 40 x 42-ft office include excellent lighting and a new board.

Entire ceiling is lighted with fluorescent tubes above white plastic egg crate louvers. Lamps are set end to end and spaced one foot apart.

Lighting intensity at the desk level ranges from 125 to 150 ft-c. In order to get equally good lighting on the vertical surface of the dispatchers board, incandescent units with concave prismatic glass lenses were placed in the louvered ceiling in a semi-circle one foot out from the board.

One unit is adjusted to light up the upper half of the board, the next unit the lower half and so on around the board. As a result, the light intensity on the board is slightly more than 100 ft-c. When these units are cut out, the power supervisor is actually given the impression that the board has moved back 10 to 15 feet. Reflection on the board from the daylight coming in from the windows is practically eliminated.

Power supervisor's board consists of 15 steel panels 3 ft wide by 11 ft high. Panels are bolted together to form a continuous semi-circle with the center in the approximate center of the room. Two desks are located in front of the board, 12 ft out from the center of the arc.

Three of the panels in the middle form a straight line and on the center panel are indicating telemeters giving the megawatt loading for generating stations, all interconnections, and many important transmission circuits. To the right of the desks are graphic instruments giving the load on the three generating stations, frequency, net tie line loading, the ac network and the dc system voltages, outside light intensity, and temperature.

Behind one desk is a teletypewriter connected to a special circuit from the Weather Bureau.

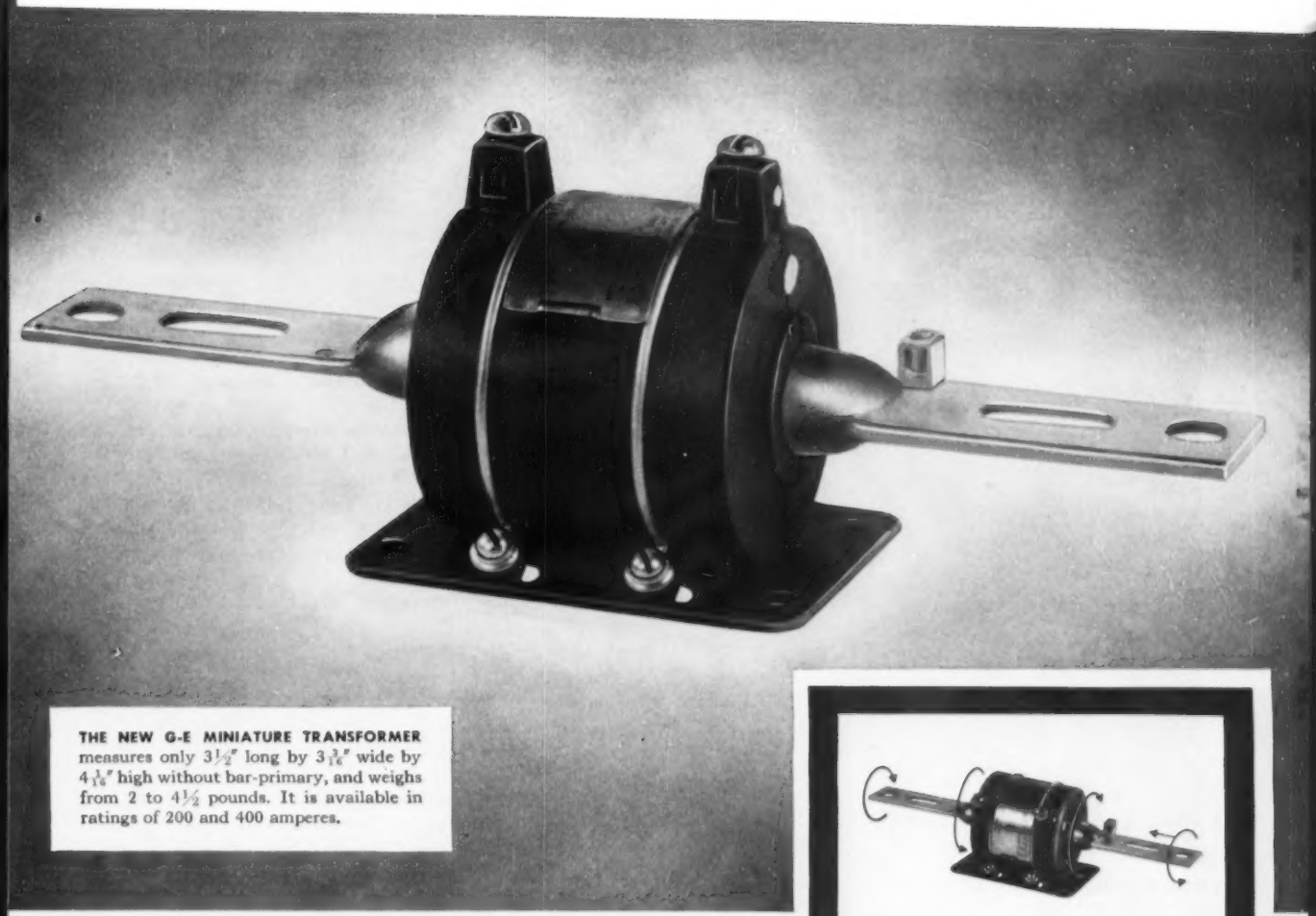
Placed on the surface of the board, using colored acetate fiber tapes, is a single line diagram of the entire system of 13.2 kv and higher. It has as few crossings of lines as possible, so that the diagram can be readily followed. In order to accomplish this, the system diagram has been broken down into voltages; each voltage system is isolated from the others. A different color tape is used for each voltage.

Magnetic buttons of colored plastic are used to show switching. The plastic button consists of two plates, the front plate being ⅝ in. in diam and the bottom ¾ in. with a magnet protruding from the base. Between the top and bottom is a reduced section or neck ⅜ in. in diam.

In applying the tape to the board, the center of the symbols for circuit breakers, air break switches, and disconnects is made either red or green to indicate the normal position of switch. If any circuit breaker or switch is put in an abnormal position, a magnetic button of the appropriate color is placed on top of the symbol.

Changing magnetic buttons on the high board without using ladders can be readily accomplished with a special stick. The stick is made of 1-in. maple, 5 ft long. On the end of the stick is a non-magnetic wire loop shaped so that the neck of the button can be slipped into the loop. The wire has been covered with tape so as not to mar the finish of the board.

Gummed paper labels are used for letters and numbers on the board. It was found after labels were applied to the lacquered finish on the board and became dry many would drop off. Adding a little glycerine to the water used to moisten labels eliminated this difficulty entirely.



THE NEW G-E MINIATURE TRANSFORMER measures only $3\frac{1}{2}$" long by $3\frac{3}{16}$" wide by $4\frac{1}{16}$" high without bar-primary, and weighs from 2 to $4\frac{1}{2}$ pounds. It is available in ratings of 200 and 400 amperes.

GENERAL ELECTRIC ANNOUNCES . . .

New Butyl-molded Miniature Current Transformer

General Electric's butyl-molded current transformer line has been extended to include a 600-volt miniature. The new Type JCA-0 features complete mounting flexibility. Designed for indoor or outdoor metering applications, the new miniature is available in 200- and 400-ampere ratings in both bar-primary and window-type construction.

MOUNTING FLEXIBILITY is provided in the Type JCA-0 first by friction-fit primary terminals. These terminals are adjustable within a 360-degree arc and can also be moved lengthwise. Also the removable base plate can be rotated within an arc of 180-degrees in relation to the secondary terminals.

INDOOR OR OUTDOOR APPLICATION is another feature of the Type JCA-0. Because of its butyl-molded construction, this new transformer can be installed either indoors or outdoors, and requires no housing or other protection from the weather.

SIX VARIATIONS of this butyl-molded current transformer are possible. It can be used as a bar-primary-type or window-type, or with or without base plate and an auxiliary mounting plate.

FOR MORE INFORMATION, contact your nearest G-E Apparatus representative, or write for bulletin GEC-1245 to: Section 604-41, General Electric, Schenectady 5, N. Y.

GENERAL ELECTRIC

BAR-PRIMARY-TYPE

Complete adjustability is available in the new transformer. The primary and secondary terminals may be adjusted and set independently of each other. This flexibility provides mounting in any position.

WINDOW-TYPE

The new Type JCA-0 transformer is also available in a window-type construction for through-type applications. This feature plus the butyl-molded construction facilitates outdoor pole mounting installations.

Mesh Guides Falling Rock; Protects Substation Equipment

W. A. HILL, Structural & Hydraulic Engineer, Washington Water Power Co, Spokane, Wash.

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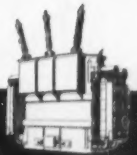
Progress Is Our Most Important Product

GENERAL ELECTRIC



Power Transformer NEWS

ANNOUNCING THE NEW G-E
INDUSTRY-STANDARD

General Electric now offers you the inventory-reducing advantages of ASA-standard bushings

Oil circuit breakers, power transformers, voltage regulators, and oil-filled reactors from 23 to 69 kv ordered from General Electric after October 1, 1954 will be equipped with G-E bushings designed in accordance with the new ASA Standards*. From then on, you'll be able to trim your costs by cutting bushing inventories and simplifying ordering and stocking.

ALL PREVIOUS ADVANTAGES RETAINED. Industry-standard bushings made by G.E. retain all the many recognized advantages of G-E bushings such as:

Center clamping to minimize the possibility of porcelain breakage.

Complete sealing to cut maintenance.

Porcelain replacement in the field without removing bushings.

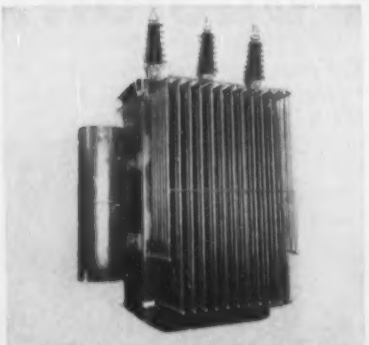
START YOUR STANDARDIZATION PROGRAM RIGHT AWAY by specifying G-E power apparatus—you'll get the new industry-standard bushing. For more information, contact your nearest G-E Apparatus Sales Office or write to General Electric Company, Section 422-21, Schenectady 5, New York.

* The applicable electrical and mechanical standards are C57.12a 1954, C57.12b 1954 and C37.4a 1954.

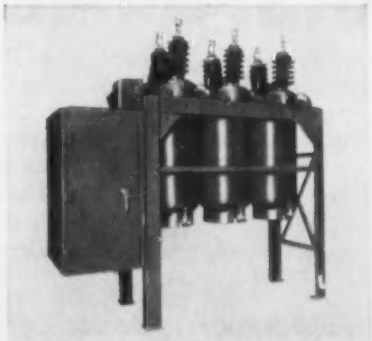
Progress Is Our Most Important Product

GENERAL ELECTRIC

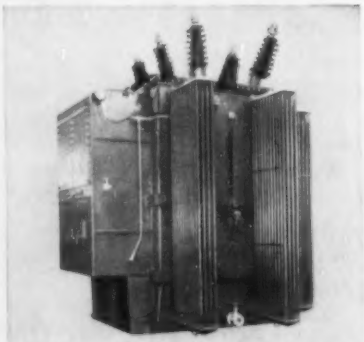
HERE'S WHERE NEW G-E INDUSTRY-STANDARD BUSHINGS WILL BE USED



POWER TRANSFORMERS

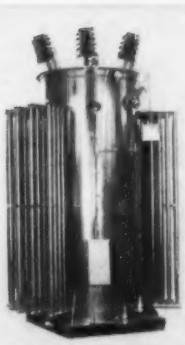


OIL CIRCUIT BREAKERS



REGULATORS

BUSHING



OIL-FILLED REACTORS

The new G-E industry-standard bushing meets requirements of ASA Standards and retains all the advantages of previous General Electric bushings.

Circulating Water

(*Continued from page* 148)

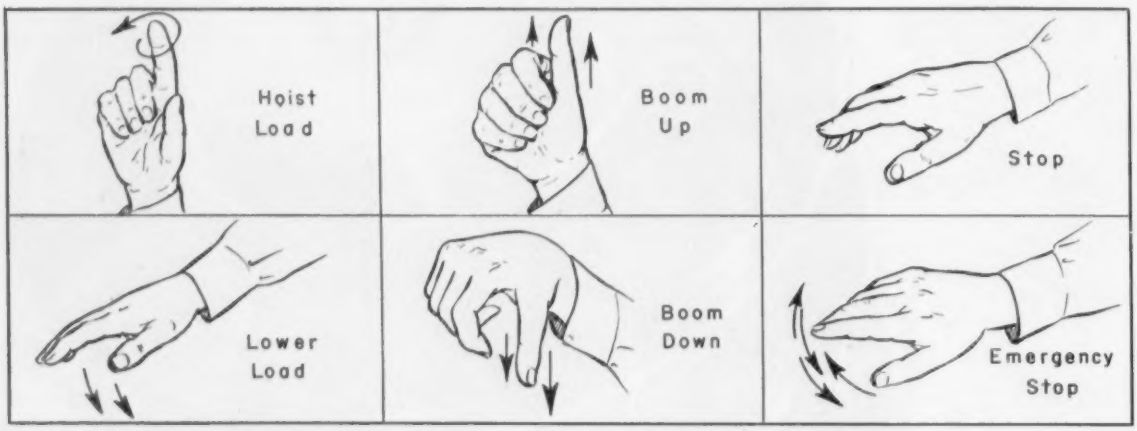
winter storms and high seas.

In order to meet the operating schedule it was necessary to start the elbows and proceed seaward while the screen well was being built. On completing the screen well the 12-ft pipes were installed out to the elbows. The illustration shows the formwork for the precast elbow which was installed about 35 ft below the surface of the beach. Since the elbows weigh about 60 tons each, it was important to provide a simple and yet accurate means for setting them in position, both horizontally and vertically.

A foot was provided on the elbows and the bottom of the excavation made level, so that when the elbow was lowered practically no further leveling was required. The necessity for speed in the operation was enhanced by the fact that the excavation was some 20 ft below water level, and as no well points were used in order to minimize construction costs, the ingress of ground water presented some risk of losing the bottom of the excavation.

It was necessary to have the extreme seaward end of the pipe about 50 ft below the ocean surface to provide the minimum required sand cover and allow sufficient depth of water for installation of vertical intake and outfall structures. Tops of structures had to be 20 ft below water at low tide.

Installation of the structures avoids the entrainment of large quantities of sand moved along the ocean bed by wave action. Outer ends of the intake and discharge pipes are about 300 ft apart to preclude recirculation of circulating water.



Crane Signals Standardized to Reduce Accidents

Northern States Power Co, of Wisconsin, has standardized on hand signals for handling loads with cranes or hoists to eliminate accidents due to faulty or misunderstood signals. This action was necessary because crews from different areas of the company's territory, who use variations of signals, often work together in times of storms and disasters.

Only the following six signals are approved for use:

Hoist load—with forearm vertical and forefinger pointing upward move hand in horizontal circle.

Lower load—with arm extended and palm downward wave hand down and up.

Boom up—with arm partially extended, fingers clenched, and thumb pointing upward move hand up and down.

Boom down—with arm extended, fingers clenched, and thumb pointing down move hand down and up.

Stop—with arm extended and palm downward hold position rigidly.

Emergency stop—with arm extended and palm downward move hand rapidly to right and left.

POLE-MATERIAL TRAILER is designed for capacity of 4,000 lb and with low center of gravity so that trailer will not tilt or sway

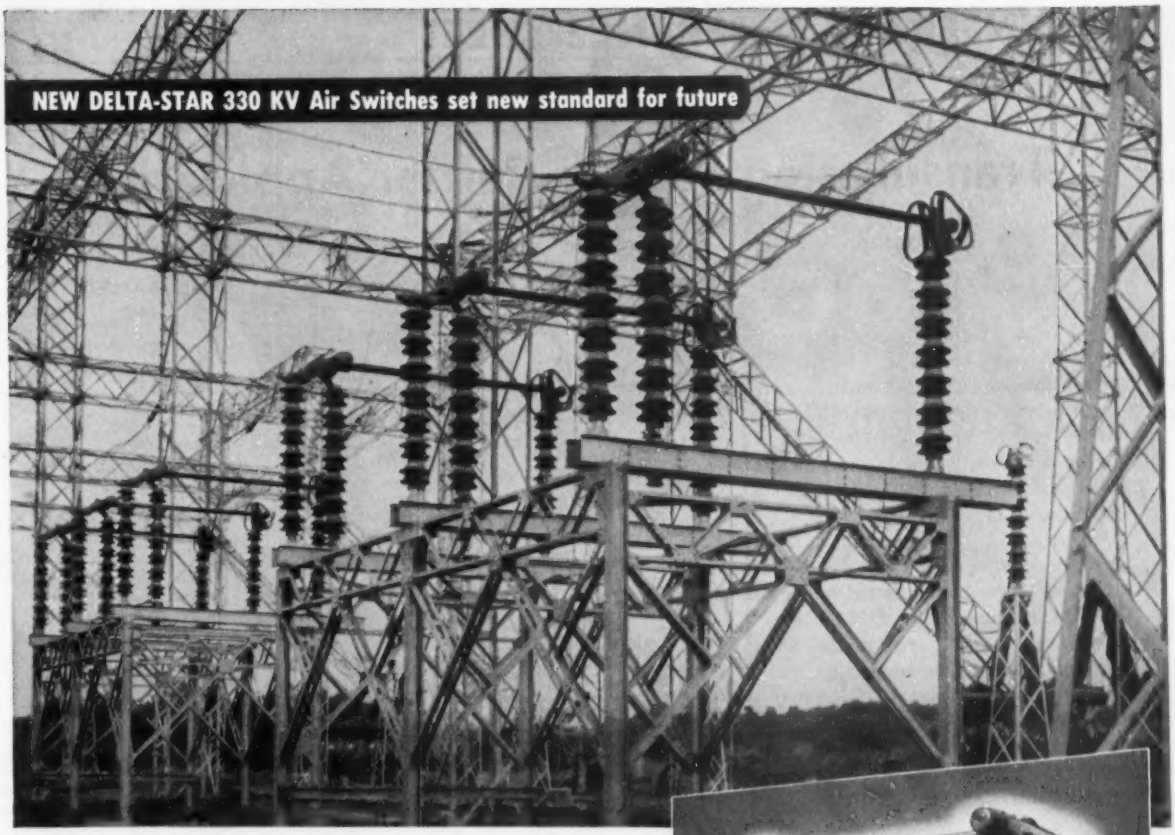
Multi-Purpose Trailer Eliminates Extra Vehicle

F. O. LEWIS, Supervisor of Transportation, Dayton Power & Light Co, Dayton, Ohio

Equipment for overhead line construction crews can be transported much easier with a multi-purpose combination pole and material trailer developed by Dayton Power & Light Co in cooperation with the manufacturer. This trailer eliminates the need of an extra vehicle for hauling poles.

Coupling to the truck can be done by one man, even

(*Continued on page* 156)

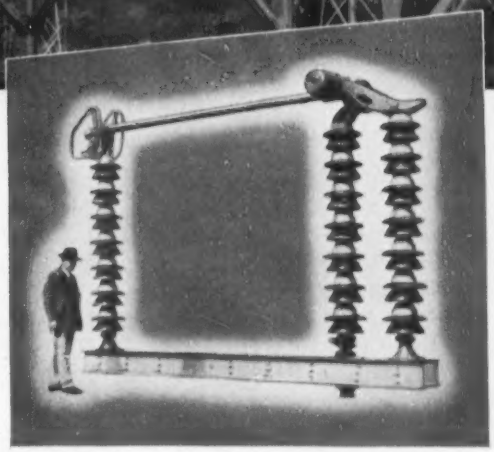


How soon will your future be in this picture?

These new ultra high voltage switches, the first to be ordered and built in this country, are now installed and ready for service. They are the forerunners for handling heavy power loads of the future.

Built along the same basic principles as lower voltage MK-40 switches, which have become the standard of comparison, these 330 kv switches set a new standard for *ultra high voltage* service. They also represent the advantages offered all utilities through DELTA-STAR specialization in carefully engineered, specially designed high voltage switching equipment.

Whether you now need switches of high voltage ratings, high current ratings or normal ratings, your preferred source, more than ever, is DELTA-STAR.



DELTA-STAR 330 kv, 1600 Ampere MK-40 Air Switch

This giant size switch has every feature incorporated in all DELTA-STAR MK-40 switches. Included are rugged high pressure contacts construction and efficiency, simplified blade actuating mechanism, a minimum number of current inter-change surfaces and ease of operation.

DELTA-STAR MK-40 switches are available in voltage ratings from 7.5 to 330 kv, and current ratings from 400 to 500 amperes.

When you want the best in high voltage switching equipment—specify DELTA-STAR

DELTA-STAR ELECTRIC DIVISION

H. K. PORTER COMPANY, INC.
OF PITTSBURGH
2437 Fulton Street • Chicago 12, Illinois
District Offices in Principal Cities

Transmission Loss in Carrier Application

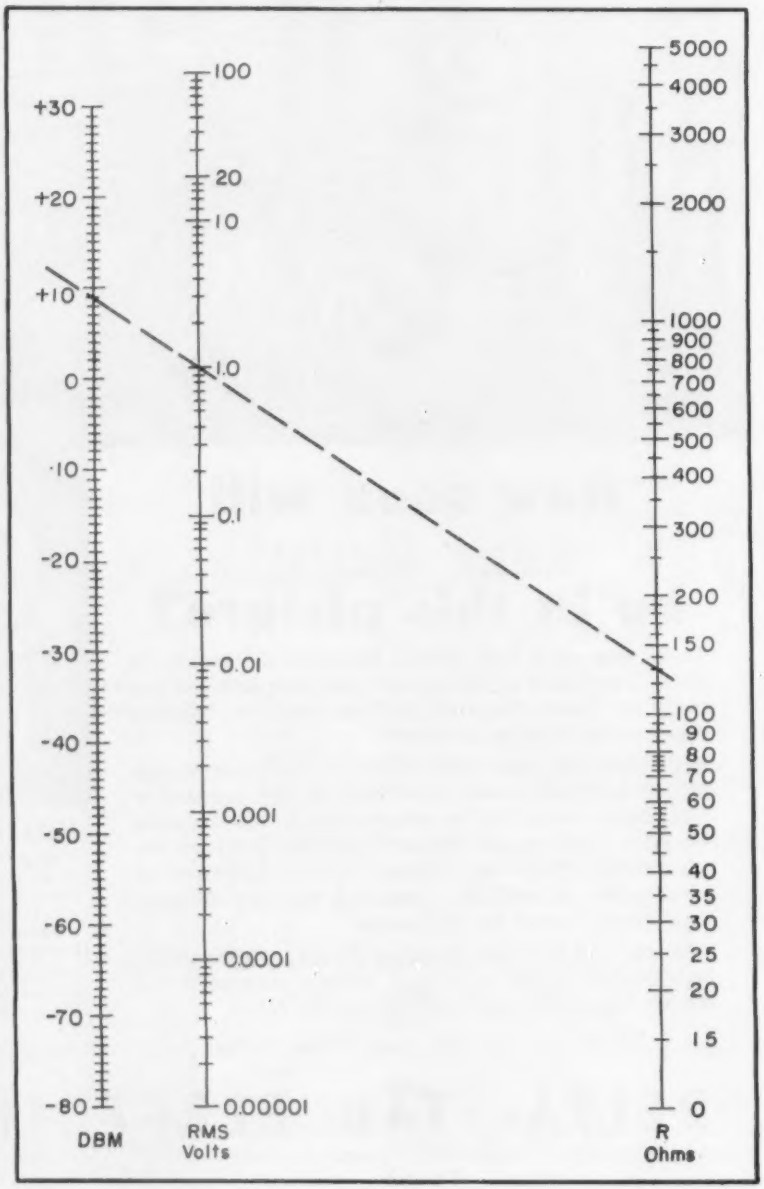
Nomograph provides a simplified procedure to find transmission loss at carrier frequencies of open-wire line.

Transmission loss at carrier frequencies is determined by the ratio of the power received from a transmission line by a receiving unit to the power available from a sending unit such as an oscillator or other signal source.

Referring to the nomograph; the power available from the oscillator, expressed in decibels, referred to one milliwatt, is found on the DBM scale. This point is at the intersection of an extended straight line connecting the points on the resistance (R ohms) scale and voltage (RMS volts) scale corresponding to the oscillator's internal resistance and to one-half the open-circuit voltage.

Power received is found at the intersection on the DBM scale with an extended straight line connecting the points on the voltage (RMS volts) scale and resistance (R ohms) scale corresponding to the measured line voltage at the receiving end and the load resistance.

Difference between the two DBM values is the transmission loss, expressed in decibels, of the open-wire line.



Nomograph is based on the equation

$$DBM = 10 \log \frac{V^2}{0.001R}$$

where

DBM = Power dissipated in a resistance R; in decibels referred to one milliwatt
V = Voltage drop across resistance R; in volts
R = Internal resistance of oscillator; in ohms

Permission of Lenkurt Electric Co.

It takes Six Bolts –

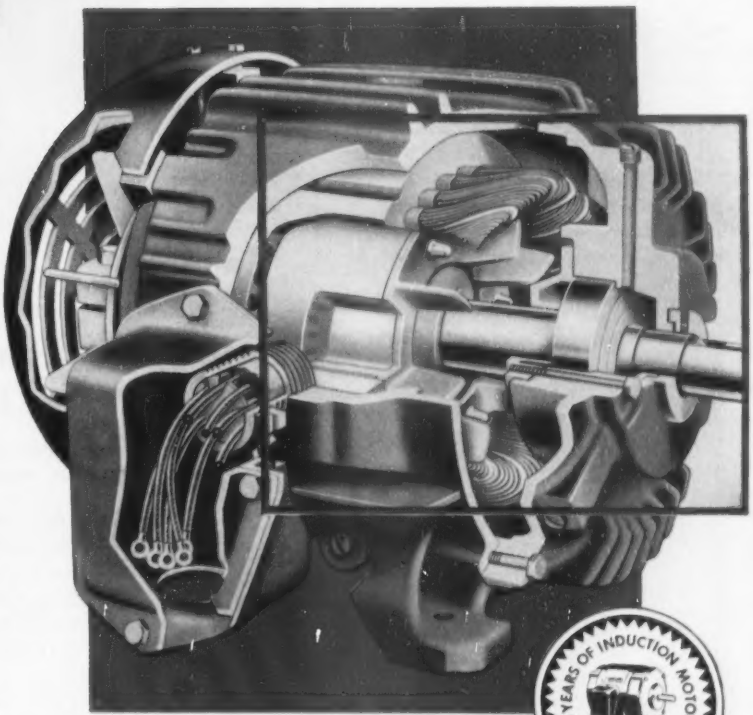
not just four

to give full bearing protection for greater motor performance

THE TWO EXTRA BOLTS in the end housing of every Allis-Chalmers ball bearing motor are the proof of *extra* protection against bearing failure. These are the bolts that hold the bearing cap tightly in place against the inner face of the bearing enclosure. This cap, with its close running clearances, keeps grease from the interior of the motor . . . retains an ample supply within the bearing enclosure . . . protects the grease and the bearing against contamination from dirt and moisture.

At the outer side of the bearing, double labyrinth seals keep grease in, also keep dirt out. What's more, large grease reservoirs act as additional dirt traps.

Result? Allis-Chalmers motors pay off in longer, trouble-free bearing life, lower motor maintenance.



50 YEARS OF INDUCTION MOTORS
ALLIS-CHALMERS-NORWOOD WKS.

Get all the facts . . . judge for yourself — Compare Allis-Chalmers motors with other motors. Get the six-bolt construction that gives you complete bearing protection. For proof, see your Allis-Chalmers Office or Authorized Distributor, or write — Allis-Chalmers, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

A-C ALLIS CHALMERS

A-4444

Multi-Purpose Trailer

(*Continued from page* 152)

when the trailer is fully loaded. Front end of the trailer is raised and lowered by means of a manually-operated hydraulic system. The drawbar is an adjustable pintle-eye type which facilitates coupling to the truck. Capacity of the trailer is 4,000 lb.

The trailer is 126 in. long, 84 in. wide and 16 in. high inside. Height from floor to ground is 26 in. Total weight is 2,710 lb.

Due to the low center of gravity and the type of spring suspension, the trailer will not tilt or sway. It can be towed safely at any speed.

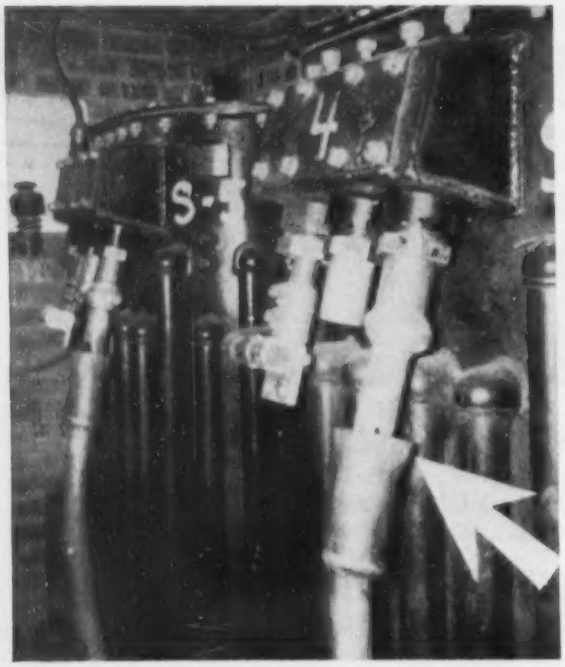
COUPLING TO TRUCK is accomplished easily by one man by means of a manually-operated hydraulic system on the front of the trailer

Converter Connects to Truck Battery; Supplies Power Tools

GEORGE R. ROBERTS, Superintendent, Transformer Department, Toledo Edison Co, Toledo, Ohio

Toledo Edison Co uses a portable electric power conversion unit for operating 110-v power tools from the 6-v truck generator. A group of trucks have been equipped with a polarized receptacle connected to the battery terminals. The conversion unit is plugged into this receptacle and the 110-v portable tool is plugged into the conversion unit itself.

The conversion unit is rated at 750 w and consists of an inverter autotransformer, and a rectifier in the output circuit. It offers a convenient source of power for portable electric tools and saves time otherwise required for making a connection to a line.



Lead Bell Eliminates Water Infiltration

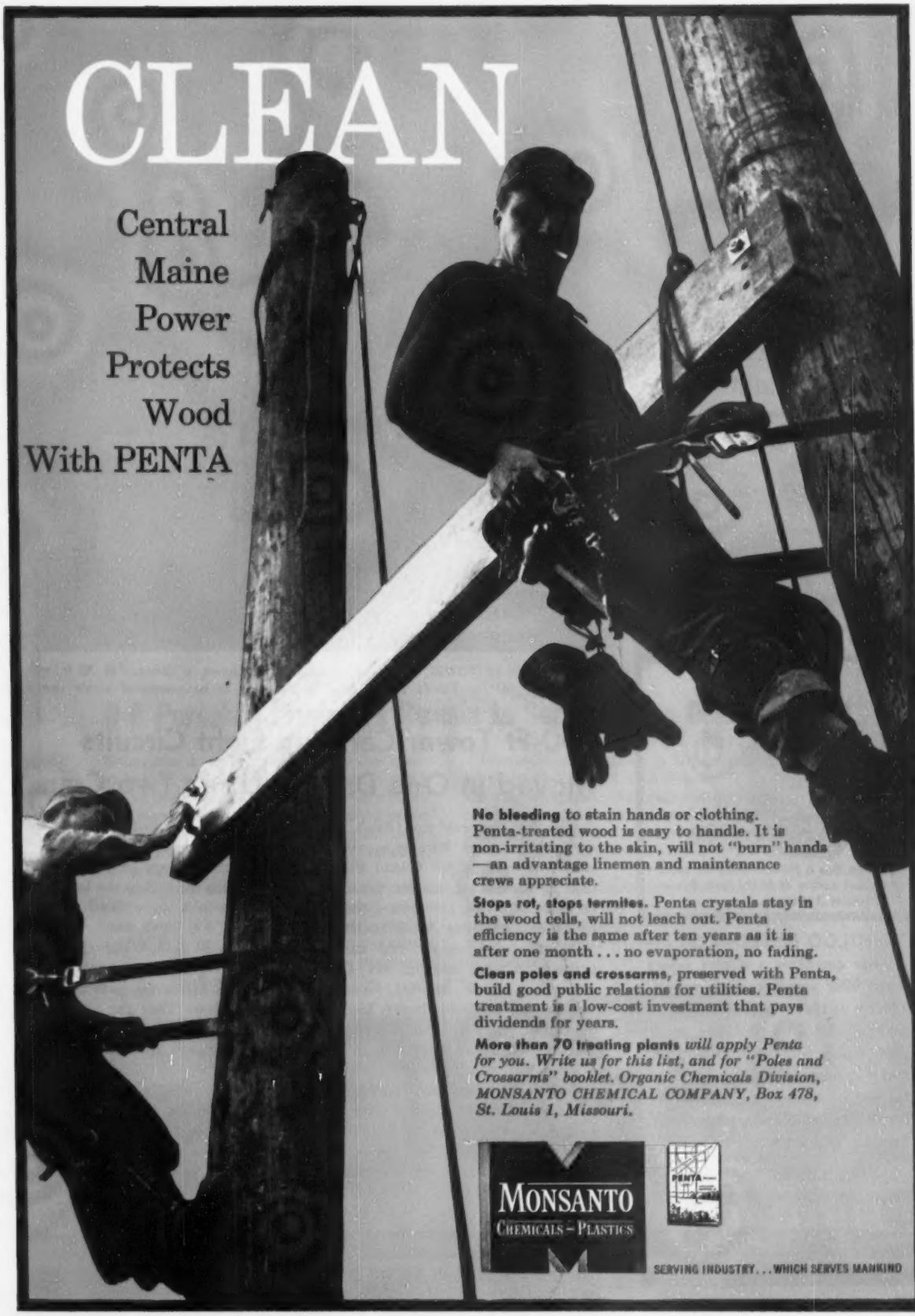
C. D. ANDERSON, Industrial Power Engineer, Savannah Electric Power Co, Savannah, Ga.

To isolate sheath currents and eliminate water infiltration in single-phase network transformers, Savannah Electric Power Co devised a simple but effective remedy.

A half-inch strip is cut out of the lead sheath and a lead bell wiped on below this cut away section. The bell is then filled with compound—making it watertight and impervious to expansion and contraction.

Previously, considerable trouble was experienced from excessive sheath currents and water infiltration. The split joint connection commonly used in this type of installation would not stay tight because of quick heating and cooling of the vault. The quick cooling was usually caused by flash thunderstorms which in some cases flooded the vaults. The vacuum thus created would literally suck water directly into the units.

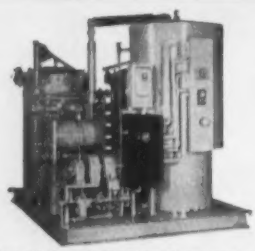
LEAD BELL (arrow) filled with compound to seal off ½ in. strip cut out of lead sheath isolates sheath currents and eliminates the infiltration of water into the single-phase network transformers


CLEAN
Central
Maine
Power
Protects
Wood
With PENTA
No bleeding to stain hands or clothing. Penta-treated wood is easy to handle. It is non-irritating to the skin, will not "burn" hands —an advantage linemen and maintenance crews appreciate.
Stops rot, stops termites. Penta crystals stay in the wood cells, will not leach out. Penta efficiency is the same after ten years as it is after one month . . . no evaporation, no fading.
Clean poles and crossarms, preserved with Penta, build good public relations for utilities. Penta treatment is a low-cost investment that pays dividends for years.
More than 70 treating plants will apply Penta for you. Write us for this list, and for "Poles and Crossarms" booklet. Organic Chemicals Division, MONSANTO CHEMICAL COMPANY, Box 478, St. Louis 1, Missouri.
MONSANTO
CHEMICALS - PLASTICS
PENTA
SERVING INDUSTRY . . . WHICH SERVES MANKIND

TRANSFORMER
OIL PURIFICATION
with the HILCO
HYFLOW OIL
RECLAIMER

reduces costs of
1 TRANSFORMER MAINTENANCE
2 OIL REPLACEMENT

With this 300 g.p.h. mobile Hilco Reclaimer the City of Tacoma, Washington, purified 100,000 gallons in three months at a saving of $20,000.

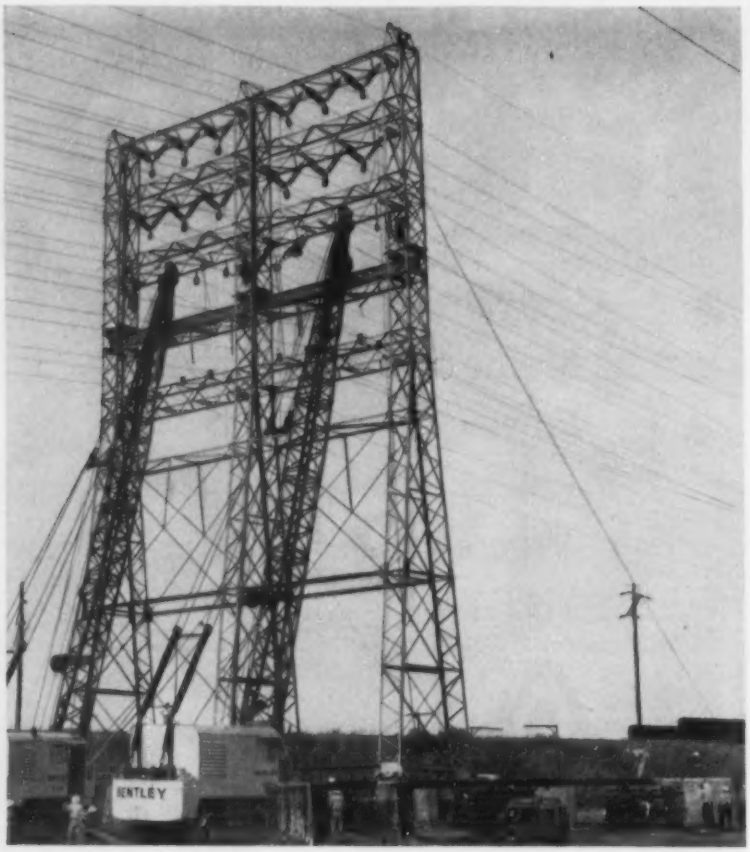


Cincinnati Gas & Electric Company reports an annual saving of $4,000 with this stationary Hilco Reclaimer.

The HILCO HYFLOW Oil Reclaimer combines a duplex fullers earth filter with a vacuum vaporization system to remove water, sludge, soluble oil oxidation products, paint, bushing compound, metallic soaps, etc. Oil is restored to new oil values as indicated by Neutralization Number, Interfacial Tension, and other tests.

• *FOR COMPLETE INFORMATION WRITE*

THE HILLIARD CORPORATION
1000 W. FOURTH ST. • ELMIRA, N. Y.



MOVING 100-FT TOWER with eight circuits, 24 conductors, a distance of 70 ft, was a tedious job for the Toledo Edison Co. The job had to be completed within one day

100-Ft Tower Carrying Eight Circuits Moved in One Day by Using Two Cranes

Clearing the way for Ohio's new turnpike involved moving a 100 ft steel tower 70 ft by Toledo Edison Co. To complicate matters, the tower carried one 36-kv, one 24-kv, and six 69-kv circuits from Acme station.

Months of planning and careful preparation went into the job. Load dispatchers made detailed plans to reroute the normally heavy load of the eight circuits over temporary lines that by-passed the tower.

Even with this provision it was essential that the job be completed in one day, a Sunday, when system load was at a minimum. Crews were on the job at daybreak the day of the move, and operation was restored to normal at 11:00 pm.

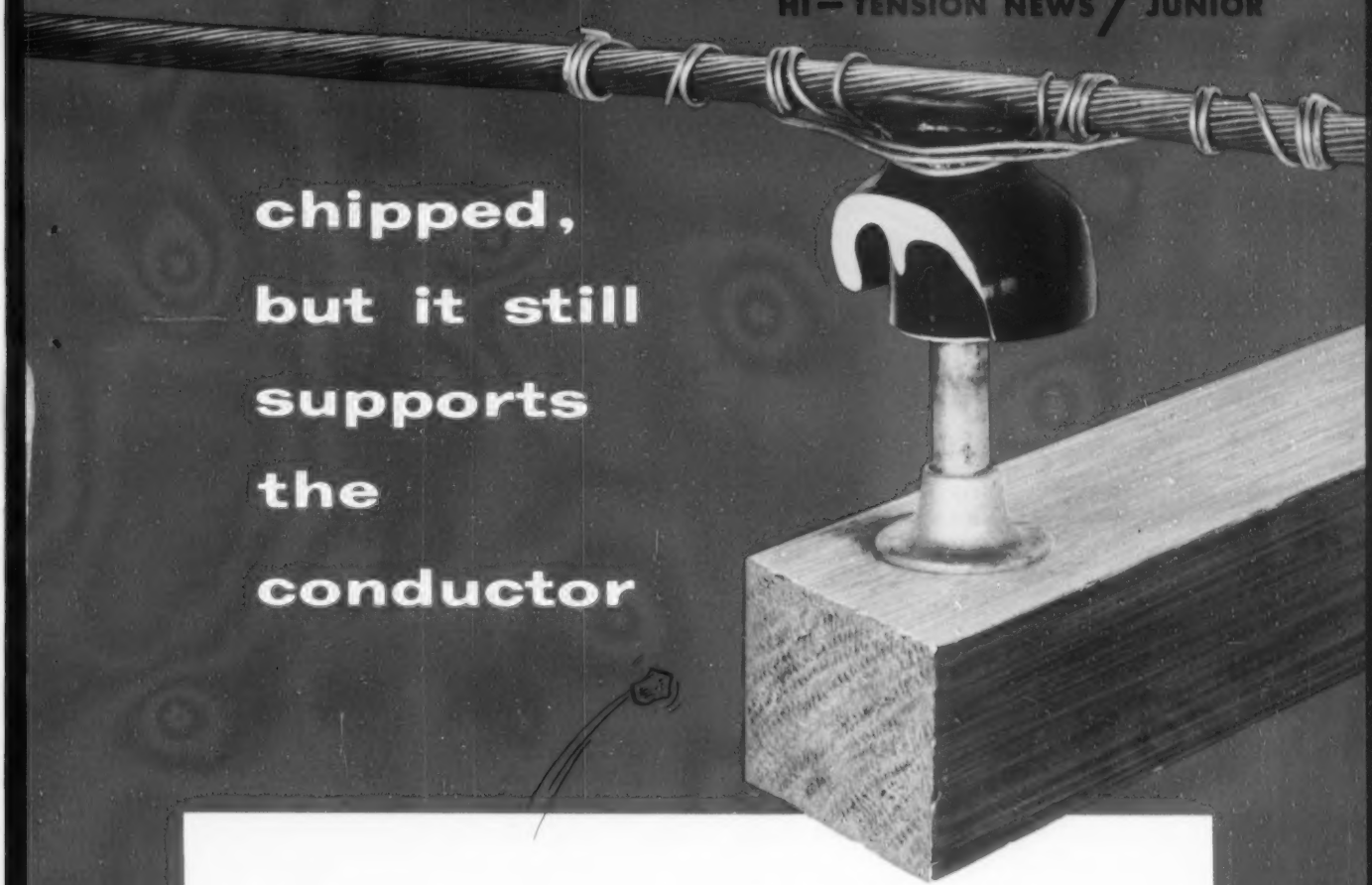
Before lifting the tower an I-beam had to be placed approximately two-thirds of the way up the tower. The steel in the tower itself was not heavy enough to support its own weight, and that of the 24 conductors of the eight circuits, for lifting purposes.

With the I-beam in position, two cranes were secured to the tower, and the tower was then lifted from its footings.

To guard against the tower toppling, steel guide rails were placed a few inches below the path the tower was to follow. Then the tower could be let down immediately without damaging the tower or lines in case of danger.

With everything in order two cranes lifted the 50-ton load a few inches above the foundation. Then came an hour of tediously inching the cranes forward to the new bases. The conductors slid easily through the pulleys. When the tower was settled on its new footings, pulleys were removed, lines were tied in, and service on them was restored.

(*More How To on page* 163)



chipped, but it still supports the conductor

O-B Porcelain Insulators Remain In Service When Damaged

Sometimes an O-B Insulator—like this one—is broken while in service. Perhaps a wind-blown branch strikes it. Or a rock. Or a bullet. But even when broken, the remaining porcelain continues to provide firm support to the conductor. There is no urgency for immediate replacement.

Ability of O-B porcelain to "take it" is important. Since it is not heat-tempered, porcelain does not have high residual internal stress. It is not prone to shatter completely and spontaneously if a portion is chipped away.

Because O-B porcelain is stress-free, insulators stay on the pin even when gouged like the one illustrated. They continue to support conductors that might otherwise be on the cross-arm, or worse, might be swinging close to the ground, offering a hazard to life and property.

Remember this about O-B porcelain insulators: they're strong; they can remain in service when damaged. Dependability like that takes a great load off of your maintenance departments.

INVEST IN SERVICE CONTINUITY WITH

Ohio Brass

INSULATORS

MANSFIELD OHIO, U. S. A.

In Canada: Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont.

Suspension Insulators

slim Strateline Clamps leave ample clearance

Save valuable inches of working room around close-spaced deadends with O-B Strateline Clamps. Locking nuts on these slender-shaped clamps lie close to the deadend center-line. In this position they leave the greatest possible safe working radius for hand wrenches. Thus with adequate hand room, men work quickly on new installations; safely on hot-line work.

Five sizes of O-B Stratelines handle cables from 0.15-inch diameter to 1.55-inch diameter. Clamp bodies and keeperpieces are of malleable iron, aluminum, or bronze. Match clamp and conductor materials to avoid electrolytic damage!

O-B Stratelines offer more-than-adequate holding strength for feeder construction at an economic price. Have your line crews give them a trial. We're sure they'll approve of Stratelines!

Ample clearance between clamps is evident, although insulators are as close together as possible
Hand wrenches swing between phases with inches to spare when you use O-B Strateline clamps.

are all the same...once!

Because of standards, all makes of suspension insulators are "the same" on the day they're placed in factory warehouses, ready for shipment. How long an insulator retains "sameness," or how rapidly it deteriorates from standards, or the extent it exceeds (and continues to exceed) standards —these are qualities only time and use make apparent.

O-B Suspension Insulators have been in use for more than 30 years on many power lines; they still give good service. Since the usefulness of an insulator in service cannot be summed up until it is replaced, owners of these lines don't know how good their 30-year old investment in insulation will eventually be. But their own records show that the performance of O-B insulation thus far is reason enough to continue buying O-B.

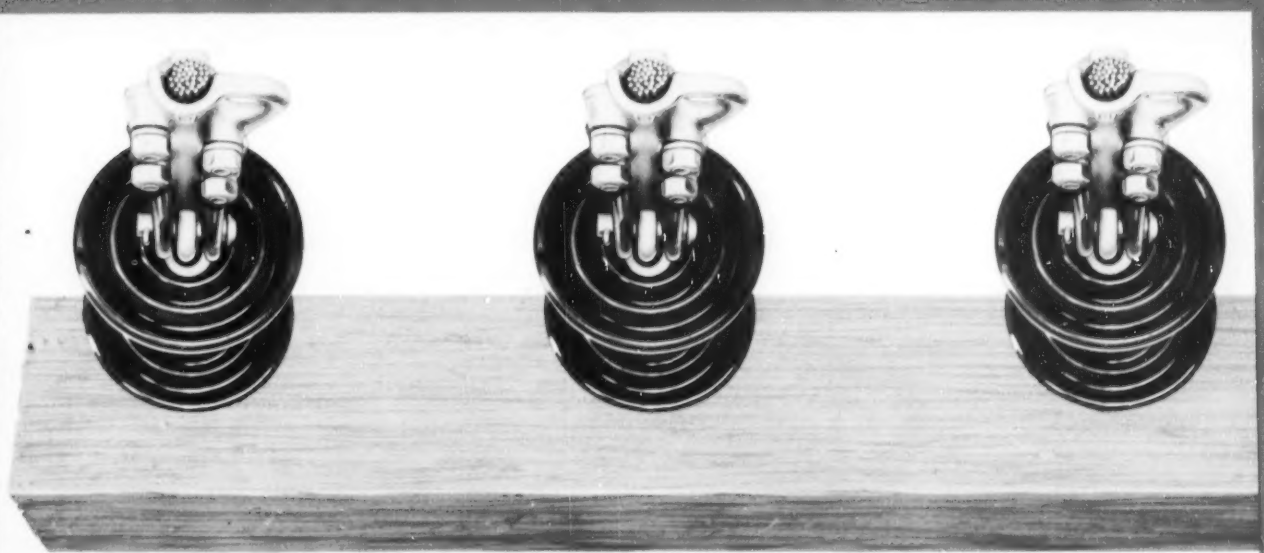
This kind of history disproves the idea of "sameness" in all makes of suspension insulators. Such records are typical of O-B Suspension Insulators. They are your best assurance that money spent for O-B insulators is money invested in long insulator service.

Usefulness of a suspension insulator string starts when it is hung on the tower. Only time will tell how useful—how good an investment —this string will be. But records covering more than 30 years show that O-B Suspension Insulators put up by the past generation are still in use. Thus history suggests that the O-B Insulators being hung here will prove to be an excellent investment.

Ohio Brass

MANSFIELD OHIO, U. S. A.

In Canada: Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont.



your extra stockroom at Graybar

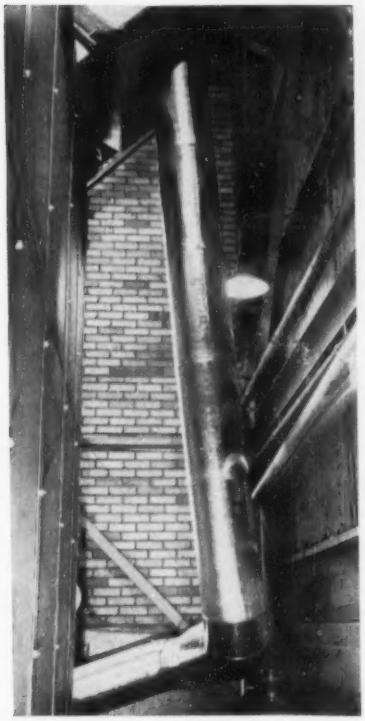
When you depend on Graybar to maintain stocks of O-B Insulators and Hardware, you really get all the advantages of additional stock room with none of the headaches. Graybar keeps up stock levels, maintains records, receives, stores, and distributes to the job all of the O-B distribution materials you need. And does all this at no extra cost to you!

Ohio Brass Company and Graybar work in close contact to keep your "extra stock room" ready. If you haven't already done so, why not sit down with a Graybar man and see how you can earmark some of this extra storage space for your use. Relieve the load on your own store room, and be assured of adequate reserves by buying distribution materials from Graybar.

Ohio Brass
MANSFIELD OHIO, U. S. A.

4429-H

(*Continued from page* 158)



AIR DUCT made of galvanized flue pipe connects the lower boiler drum to the suction side of the ID fan. Cool air moved down through boiler and carried dust out stack

"Air-Conditioning" Speeds Tube Cleaning

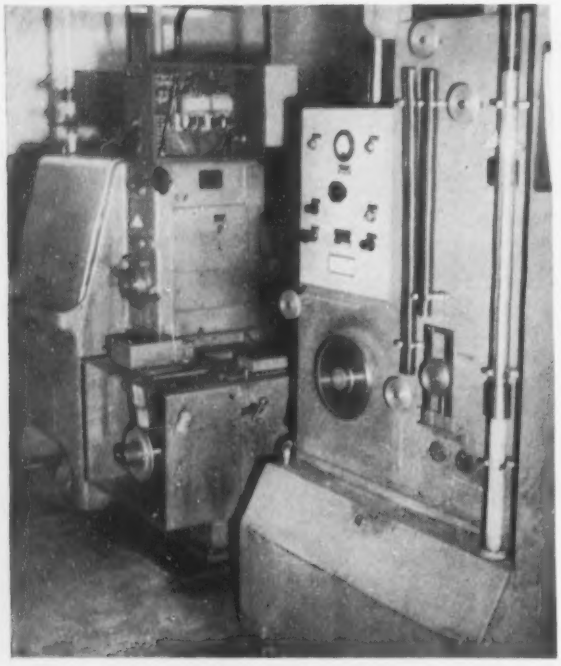
With the aid of a flue pipe and the induced-draft fan, boiler tube cleaning was done in "air-conditioned" comfort at Southwestern Public Service Co's Guymon Plant. Operators were able to "rattle the tubes" more efficiently in a dust-free boiler drum that was constantly cooled by fresh air.

Galvanized flue pipe was installed with adapters between the lower boiler drum and the ID fan breeching on the suction side. During boiler cleaning the fan pulled fresh air through the manhold in the top drum. From the top drum the air went down the boiler tubes, into the bottom drum, through the duct, and out the stack.

Cost of flue pipe and screws was under $20. The adapters for the boiler manhole and fan breeching were made in a few hours from scrap material.

Installed cost of the piping was small compared to the efficient manner in which the job was done.

For that EXTRA SAFETY FACTOR
in OVERHEAD GROUND WIRES
Crapo
Weldless
Galvanized
STEEL STRAND
MAXIMUM STRENGTH and dependability in overhead ground or static wire is assured when you specify Crapo Weldless Galvanized Steel Strand, specially designed and manufactured to shield transmission lines against lightning.
CONTINUOUS LENGTHS of this 7-wire strand are produced without welds or joints of any kind in either the individual wires or finished strand. High fatigue endurance provides that extra factor of safety so important in overhead ground wire. Laboratory-controlled manufacturing constantly insures high, uniform quality to make it your most practical and economical strand for this purpose.
Crapo GALVANIZING applies a dense, uniform and ductile zinc coating, tightly bonded to the wires for lasting protection against corrosion. Crapo Weldless Galvanized Steel Strand is available with Class A, B or C coatings in approved sizes and grades.
Ask your Crapo representative for Booklet OG-25 containing Sags and Tension data . . . or write direct!
INDIANA Steel & Wire Co., Inc.
MUNCIE, INDIANA



AUTOMATIC WIRE DRAWING machine solves delivery problem and lowers unit costs. Copper is drawn to wire, annealed, quenched and spooled at rate of 3,500 to 5,000 ft per min in one continuous operation. Drawing machine is at right with dies and take-up spool at left

Automation Lowers Wire Cost

R. B. RUSSELL, Industrial Power Engineer, The Connecticut Light & Power Co., Willimantic, Conn.

Drawing wire to various sizes with an automatic wire drawing machine at Plastic Wire & Cable Corp, Jewett City, Conn., has lowered unit costs, and saved time in awaiting delivery of purchased wire in particular sizes. It permits the company to draw any size wire whenever necessary. In one continuous operation rod copper is drawn to wire, annealed, quenched and spooled at the rate of 3,500 to 5,000 ft per min.

A ⅜-in. diameter soft copper rod enters the heavy duty rod breakdown machine and goes through 13 successive drawing dies for an approximate 20% reduction per die. This arrangement of dies in banks greatly reduces the time for wire drawing operations. The annealer and take-up machine constitute the automatic process equipment which continuously anneals and spools the product of the wire drawing machine.

The annealer portion of this equipment is located between the wire drawing machine and the take-up. It consists of four power-driven contact sheaves over which wire passes on its way from the drawing machine to the spool. These contact sheaves are electrically energized by a variable voltage low potential transformer located behind the annealer. In order to provide a protective atmosphere for the annealed wire a steam supply is piped into the annealing tube above the quench tank. The final contact sheave is located in the quench tank at the lower end of the annealing zone. Initial cooling of the wire takes place in this tank. Most of the annealing heat is extracted from the copper in the quench tank and in the cooling pipe leading from the quench tank.

The take-up unit consists of two separate single spool units mounted on individually retractable carriages. Mounted in each unit are magnetically operated brakes for stopping the full spools. Air ejectors are incorporated for removing full reels from arbors to the reel elevator. An air operation elevator platform is provided for lifting reels to arbor positions and for lowering them to the run-off level.

Directly over the two spooler units is a transfer head on which the wire distributor is mounted. The distributor is driven by a variable speed drive unit, hydraulic pump, dual electric valve, traverse cylinder and other associated parts. Energizing one of the valves causes the distributor to move to the left and energizing the opposite valve causes the distributor to move to the right. Valves are controlled by position of a lever switch located in the center of the transfer head. The speed of the traverse governs the wire pitch or lay, and can be varied by changing the speed of the traverse pump drive unit.

At this point the 1,000-lb capacity take-up spools are ready for further processing in the intermediate or fine wire drawing machines. Here the processes of drawing, annealing, quenching and spooling are repeated, producing a fine copper strand.

Electric Furnace Has Low Maintenance Cost

RALPH O. SMITH, Industrial Power Engineer, Connecticut Light & Power Co, Essex, Conn.

Accurate temperature control, flexibility of operation, and low maintenance costs are provided by an electric annealing furnace used for normalizing steel castings at the Malleable Iron Co, Branford, Conn.

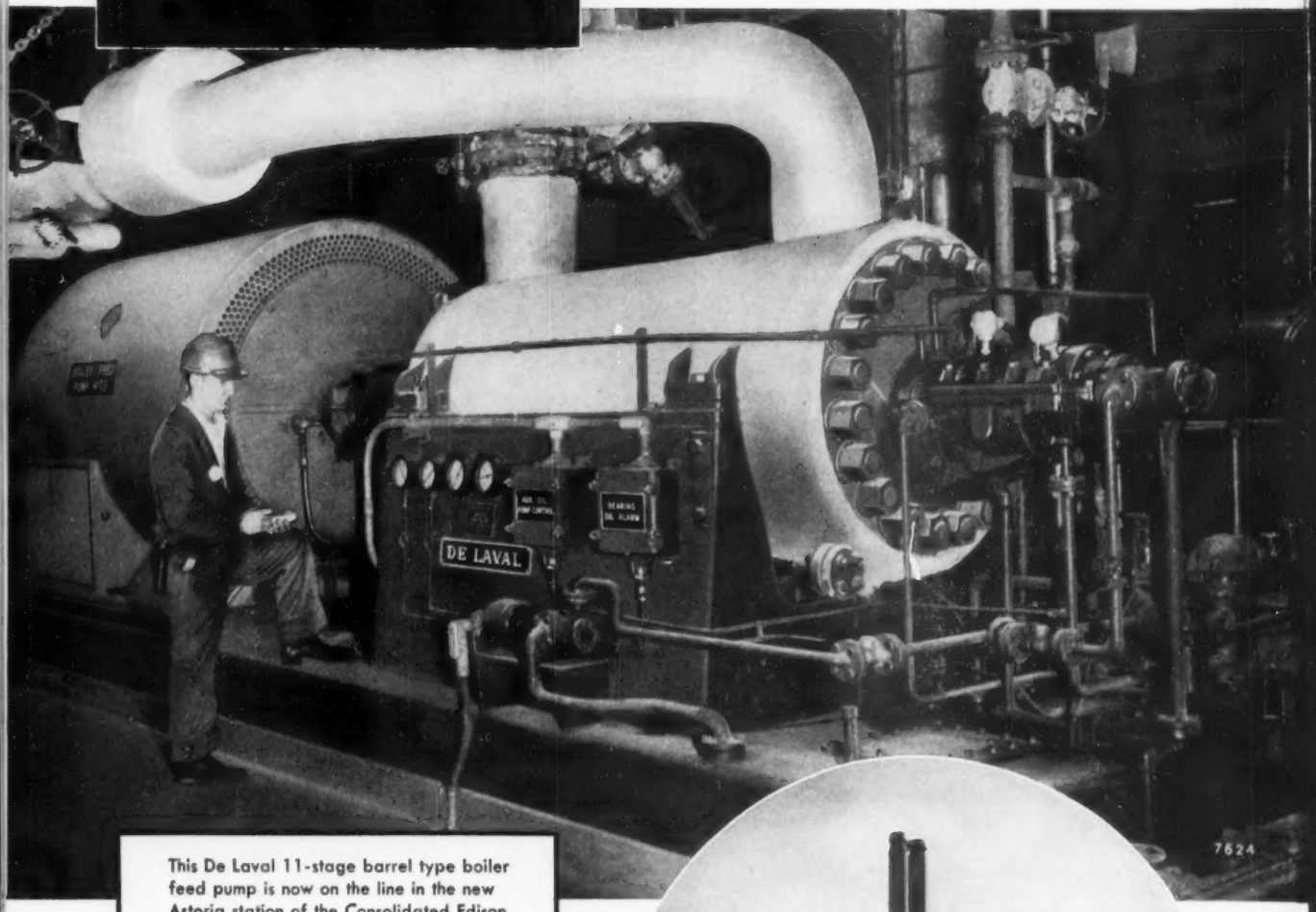
Maintenance of the furnace is kept at a minimum as the nickel-chromium wire grid electric elements are made and replaced by factory maintenance men and the furnace itself has required rebuilding only once in the 20 years of operation.

This 450-cu ft, 3-phase, 500-kw furnace takes a load of from 6 to 15 tons of low carbon steel castings to be normalized. The castings are on special order for machine tools, gear blanks, rolling mill machinery, ship machinery and for many other uses. Normalizing steel castings relieves all internal stresses making the castings softer and more machineable.

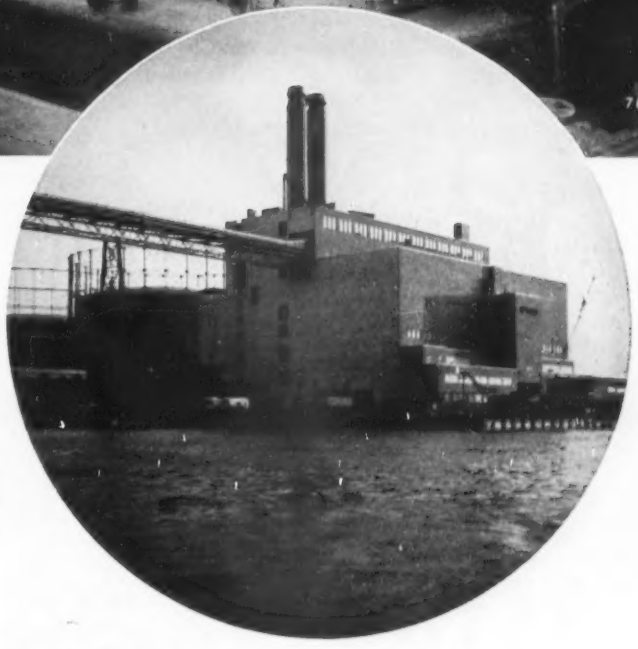
The furnace car is loaded during the day and driven by its own motor into the garage type enclosure. Electric units, mounted on three walls and the sliding door, are connected to control the temperature of the front and

DE LAVAL
BARREL TYPE BOILER FEED PUMP

in new Con Edison Astoria power station



This De Laval 11-stage barrel type boiler feed pump is now on the line in the new Astoria station of the Consolidated Edison Co. of New York.



The De Laval 8/6 pump operates at 129 psig suction pressure and delivers 1,570 gpm of 344 F water against 2,229 discharge pressure. Direct-connected at the end of the boiler feed pump shaft is a De Laval IMO pump for lubrication of the main pump and motor bearings. Also furnished is a motor-driven De Laval IMO auxiliary oil pump with pressure controlled switches. De Laval barrel type boiler feed pumps meet all the requirements of high pressure, high temperature boiler feed service. The distinctive De Laval design assures years of reliable operation with minimum maintenance.

DE LAVAL *Boiler Feed Pumps*

DE LAVAL STEAM TURBINE COMPANY

861 Nottingham Way, Trenton 2, New Jersey

HEAVYWEIGHT SHEDS 280 POUNDS!

ANOTHER WESTINGHOUSE "FIRST"— NEW CONTROL CENTER STRUCTURE MADE OF REYNOLDS ALUMINUM

Always a pioneer in developing the latest in electrical apparatus, Westinghouse again leads the way with this all-aluminum control center structure. Using Reynolds Aluminum, Westinghouse reduced the enclosure weight from 430 pounds to slightly over 150 pounds.

Aluminum is used throughout – from outer cabinet, sub-base and screen baffles to vertical and horizontal bus bars.

Aluminum offers a more attractive, clean-cut appearance – important in applications where cleanliness and neatness are necessary. Aluminum offers the corrosive resistant qualities so necessary in chemical plants. In the words of Westinghouse "– aluminum opens new fields of greater performance in control center applications."

This significant advance in the electrical application of aluminum is another reason why...

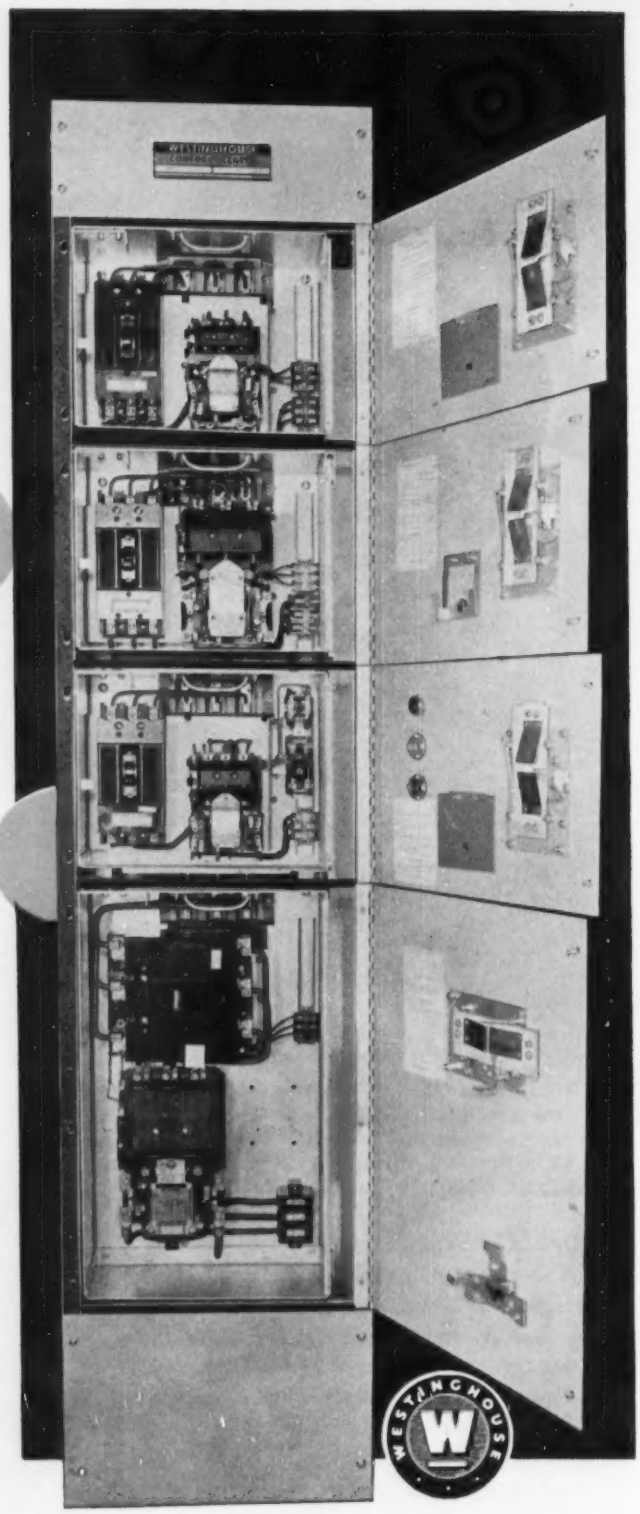
"You Can Be Sure...If It's Westinghouse."

Look to Reynolds *Complete* Electrical Engineering Service for Answers to *Your* Problems

Reynolds treats each design, construction or production problem as a *new* problem. The Reynolds staff offers you the maturity of experience. Yet, unhampered by precedent, these are men who think in terms of tomorrow's needs *today*. Men whose vigor and skill combine with the latest production facilities and methods to help keep your quality standards highest, your costs low.

Reynolds engineers will conduct meetings with your men to provide them with the latest information on electrical applications of aluminum. Also write for a complete index of design and fabrication literature. *Reynolds Metals Company, 2584 South Third Street, Louisville 1, Kentucky.*

See "Mister Peepers", starring Wally Cox, Sunday nights on NBC-TV



REYNOLDS ALUMINUM

MODERN DESIGN HAS ALUMINUM IN MIND

(*Advertisement*)

Electrical Applications of Aluminum

Covered Conductor

The lighter weight of Neoprene covered aluminum conductor permits longer spans, speeds installation and cuts labor costs on secondary lines and service drops. Aluminum conductor also has a lower initial cost and Neoprene covering is long lasting and weather resistant. These factors add up to important original and maintenance savings.

Reynolds Metals Company now offers a complete line of Neoprene covered aluminum conductors—single conductor and self-supporting duplex, triplex and quadruplex cables. For complete information write to Reynolds at the address on the facing page.

Aluminum Cable Steel Reinforced

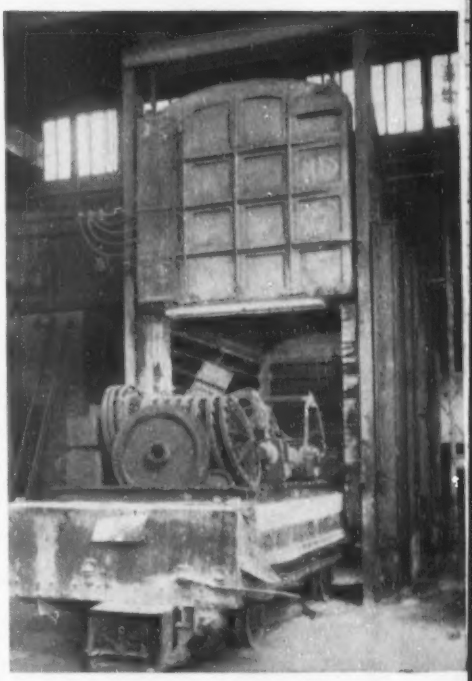
Worthwhile transmission line savings are possible with ACSR because the initial cost of this steel reinforced cable is less. You can also save through reduced handling and field costs because men and equipment handle 20% less weight so stringing is easier and faster. Longer distances between poles or, because there's less sag, use of shorter poles or towers permits further economies.

Reynolds ACSR conforms to or exceeds ASTM and ASA specifications. Reynolds ACSR manual for engineers has complete basic line design and erection information ... sag-tension charts, stringing tables, stringing-sag tables, etc. This book is available without charge when requested on business letterhead. Write to Reynolds Metals Company at the address on the opposite page.

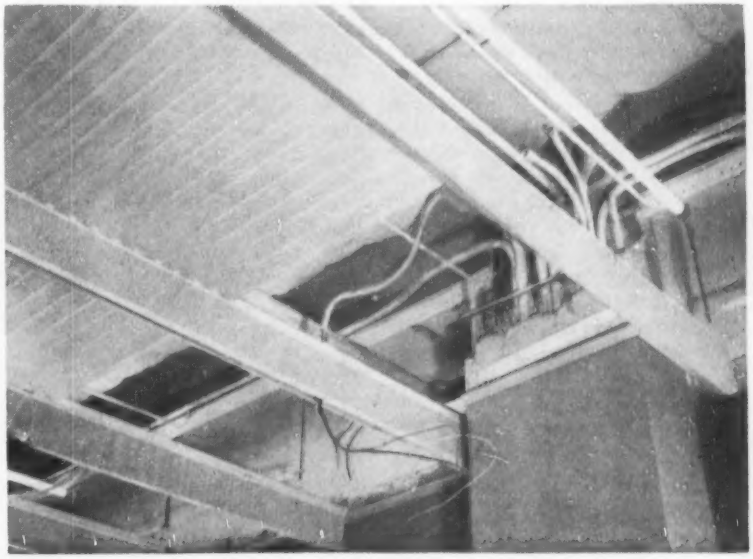
rear zones of the furnace independently. Normalizing is accomplished during the night, after the main plant electric load has been shut off. When the required temperature of 1750 F is reached, it is held very closely by recording type instruments. This temperature is held for the prescribed soaking period—generally one hour per inch of casting cross section is necessary.

At the end of the soaking period, the loaded car is driven out onto the foundry floor for an air quench. Here it is allowed to cool until it can be unloaded during the day shift.

Normalizing done during the night shift has several advantages. The mass of material at 1750 F could not be brought out on the foundry floor for an air quench at any other time. Also, with the loading done during the normal working day, the castings are placed on the car as they are prepared. The major shop electrical load goes off late in the afternoon so the heating of the furnace causes no increase in power demand. The company, therefore, has benefit of high kilowatt-hours with no demand increase



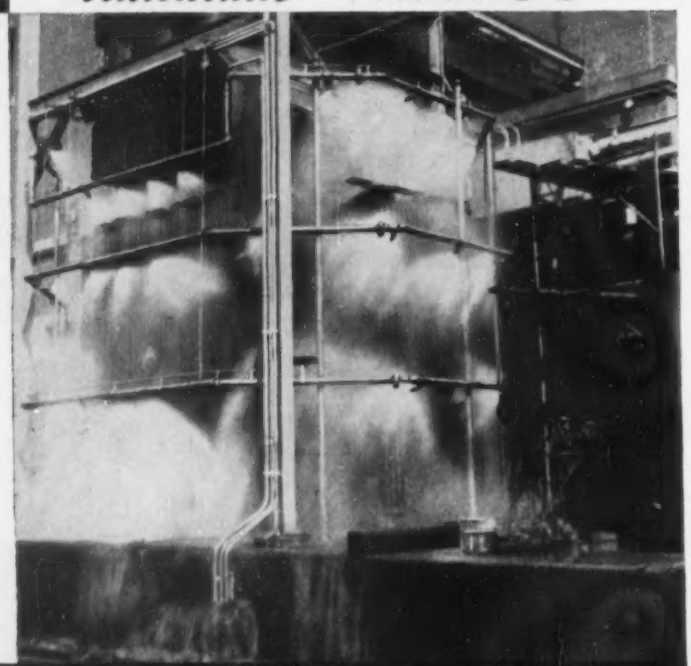
FURNACE CAR, loaded with low carbon steel castings is driven into 500-kw furnace for normalizing during night after main plant load has been shut off



Electrical Ceiling Combines Services

Seven basic services are integrated into a single electrical ceiling unit in the new, engineering building of the Douglas Aircraft Co, Inc., El Segundo, Cal. The ceiling provides (1) Fully diffused 90-100-ft-c lighting (2) Acoustical equipment for noise control (3) Power distribution for electrical office equipment (4) Telephone services (5) Public address system (6) Air distribution system (7) Sprinkler system. The luminous ceiling lighting system is by the Wakefield Brass Company

"Automatic" FIRE-FOG

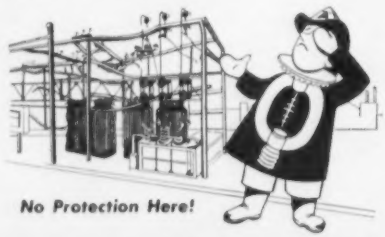


Much More Than a Little More Protection

With each new installation (photo shows water flow test on 50,000 KVA transformer*) "Automatic" FIRE-FOG establishes its ability to extinguish electrical fires faster, safer and more economically than any other method.

Heat sensitive rate-of-temperature-rise thermostats detect fire within seconds of its origin. Scientifically designed spray nozzles discharge mist-fine "Automatic" FIRE-FOG throughout the fire area. Extinguishment is complete — final. Significantly, "Automatic" FIRE-FOG protection is always in readiness for instant, automatic action; now — next week — next year, or whenever fire threatens.

More detailed information on "Automatic" FIRE-FOG as pertains to your particular needs is available upon request. Send the coupon.



No Protection Here!

* Installation for Hartford Electric Light Co., So. Meadow Sta., Hartford, Conn.

Stone & Webster Engineering Corp., Boston, Mass. — Engineers and Constructors.

"Automatic" Sprinkler Corp. of Amer.
Youngstown, Ohio

Please rush copy of Bulletin 64 — Design and Application of "Automatic" FIRE-FOG

Name .....

Title .....

Company .....

Address .....

City ..... State .....

"Automatic" Sprinkler
CORPORATION OF AMERICA
YOUNGSTOWN, OHIO
Offices in principal cities of North and South America

INDUSTRIAL BRIEFS

Pre-heating briquets with radiant heaters is part of process used in their manufacture by the Anthracite Institute, Wilkes-Barre, Pa. Developed for grilling, broiling and barbecuing, the new type briquets are pre-heated with 15 kw of radiant units before they are impregnated with an igniting solution. Shell Gearhart, Industrial Power Representative, Pennsylvania Power & Light Co, Wilkes-Barre, Pa.

Drying display cards in conveyorized infrared oven at Curzon Advertising Display Co, Omaha, Neb., permits complete drying in less than one minute. Previously, air drying required one hour. Oven has four 2,500-w radiant heating units. Temperature and conveyor speed are adjustable to rate at which vapor-filled air is exhausted. This permits handling of all types of materials and finishes at exactly the right heat and exposure time. R. J. Curzon is not only pleased with increased production but also with the system's low operating cost. Omaha Public Power District's "Ideas."

Brazing copper refrigerator mufflers in electric furnace at Acklin Stamping Co, Toledo, Ohio cuts production costs 87%. After two years operation of 16 hr a day, 5 days a week service at 2050 F, total down time has been only 40 hours. The refrigerator muffler assembly costs 3 cents as compared to 24 cents when hand arc welded. As many as 300 of these mufflers can be copper brazed per hour. The mesh belt furnace also expedites production of components of other household appliances and agricultural and automotive equipment. Driver-Harris Co, Harrison, N. J.

Handling paper in warehouse area of Carpenter Paper Co, Minneapolis, Minn. with 10 battery-operated, fork-lift trucks and tractors gives fume-proof operation not possible with gasoline driven trucks. Batteries for this equipment are charged by two - 2-kw, six - 3-kw and one - 5-kw motor-generator sets. Drivers can plug in for battery charging at any time, however, equipment is usually charged after hours. A. W. MacNabb, Power Sales Engineer, Northern States Power Co, Minneapolis, Minn.

ALL THE FEATURES *plus*....

MATCHED ENCLOSURES!

SQUARE D's
NEW
POWER-STYLE
SWITCH BOARDS

DESIGN LEADERSHIP FEATURES

Distinctive Styling provides an attractive, modern appearance matching the control center design.

Easier Installation because removable front and back plates expose generous wiring parts. Isolated horizontal wiring trough has drop-off openings, assuring safer, neater wiring.

Flexibility. Complete sections or branch units can be added or changed to meet specific job requirements.

Easier Inspection and Maintenance. Front, side and back plates are removable, thus providing easy and immediate access to specific areas.

SEPARATELY.... OR AS A TEAM THEY DO THE JOB BETTER!

Write for Bulletin SD-18. Address Square D Company, 6060 Rivard Street, Detroit 11, Michigan.

Write for Bulletin 244. Address Square D Company, 4041 N. Richards St., Milwaukee 12, Wisconsin.

SQUARE D's **NEW**
PLUG-IN
CONTROL CENTERS

DESIGN LEADERSHIP FEATURES

Increased Safety because bus bars are fully enclosed, rigidly supported and have ample cross section...circuits isolated by individually enclosed plug-in units...disconnect handle designed for maximum operator protection.

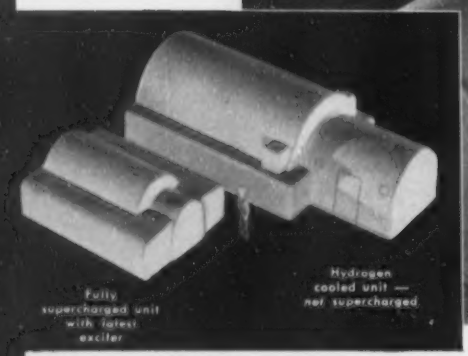
Flexibility. Individual plug-in units or complete sections can easily be added, removed or exchanged. Push-buttons, pilot lights, and selector switches can readily be added to unit doors.

Installation Economy. All wiring channels are large and accessible from front without removing units...no "wire fishing."

Space economy, too. Up to six combination starters fit in a 20"x20"x 90" section. Plug-in unit heights are designed in space-saving increments of 3 inches.

SQUARE D COMPANY

ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS



Fully supercharged unit with latest exciter

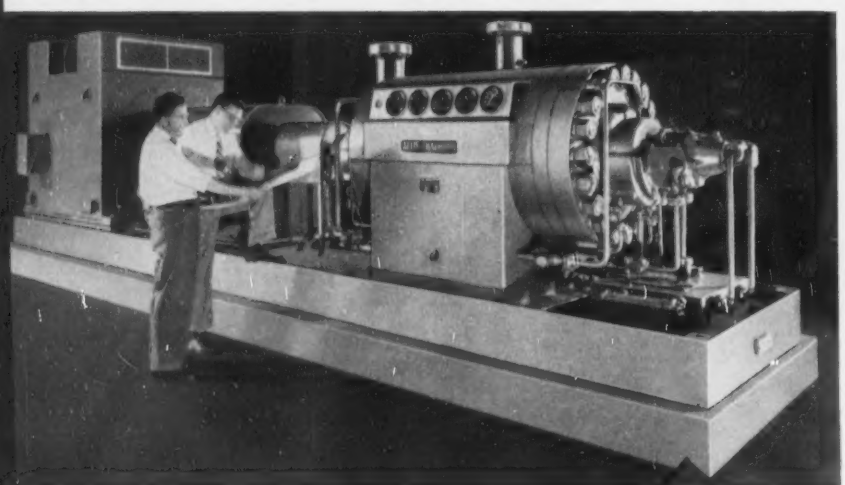
Hydrogen cooled unit — *not* supercharged

Supercharged Hydrogen Cooling! The first trend-setting rotor supercharged steam turbine generator unit established availability record of 99.86% during first two calendar years. Models of generators at left clearly show relative size reduction obtainable with fully supercharged cooling.

ALLIS-CHALMERS

Utility Equipment

Here are just a few of the many developments introduced by Allis-Chalmers in the last few years for the fast-moving utility industry. For information on any of these items call your nearby A-C office or write Allis-Chalmers, Milwaukee 1, Wisconsin.



Developments in Motors and Pumps for Boiler Feed Service

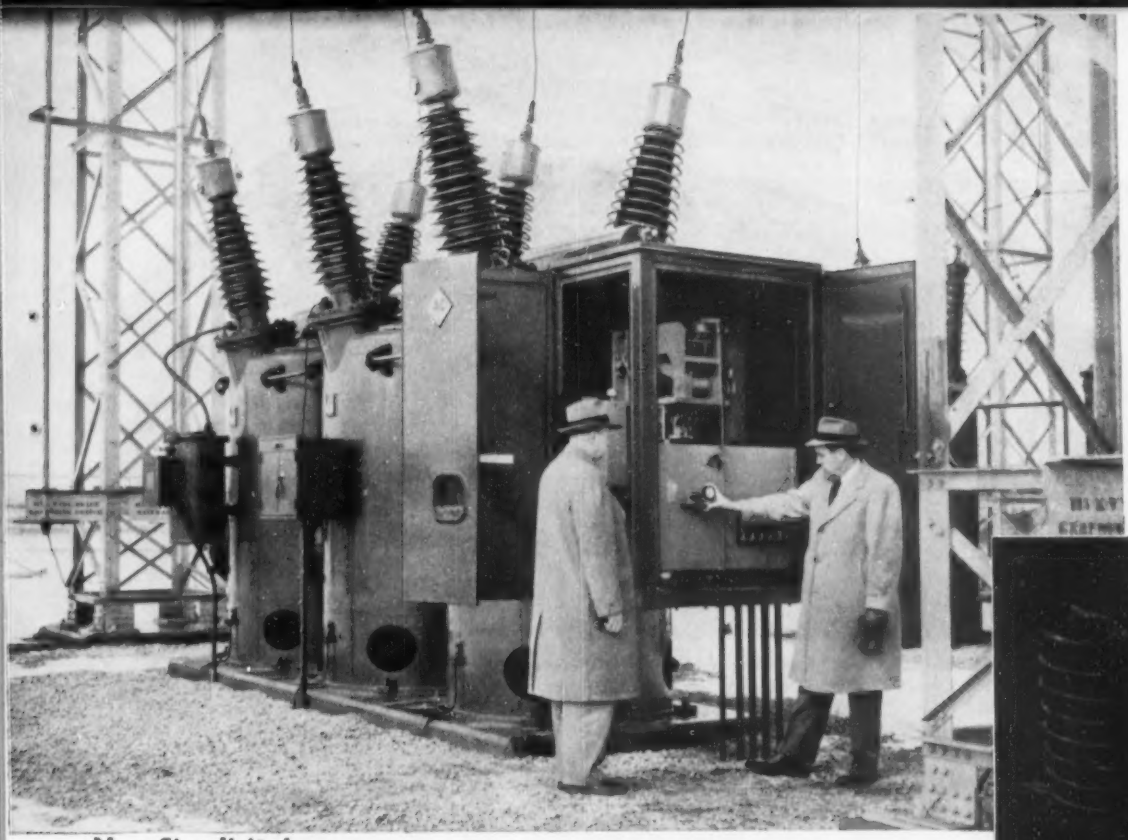
Redesigned Two-Pole Motor — Top air intake and discharge *plus* spiral stator core ventilation are now featured. Top air discharge permits closer mounting of motors. Spiral ventilation assures even internal cooling...helps reduce noise. In addition, motor has modern appearance and new capsule-type bearings are provided.

Latest Boiler Feed Pump — Recent refinements include simplified oil piping arrangement and lagging around barrel to permit insulation of barrel and provide improved appearance. Pump is barrel-type for high efficiency, high pressure service. Single stage back-to-back impellers balance axial forces without use of balancing drum. Double volute casings balance radial forces.

Pneu-Draulic is an Allis-Chalmers trademark.

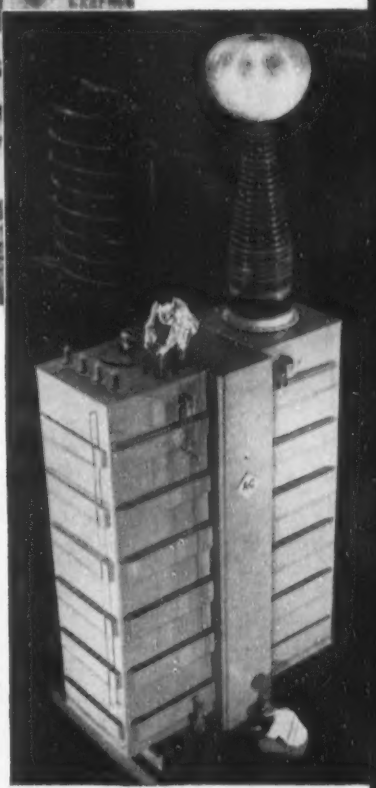
A-C ALLIS-CHALMERS

ALLIS-

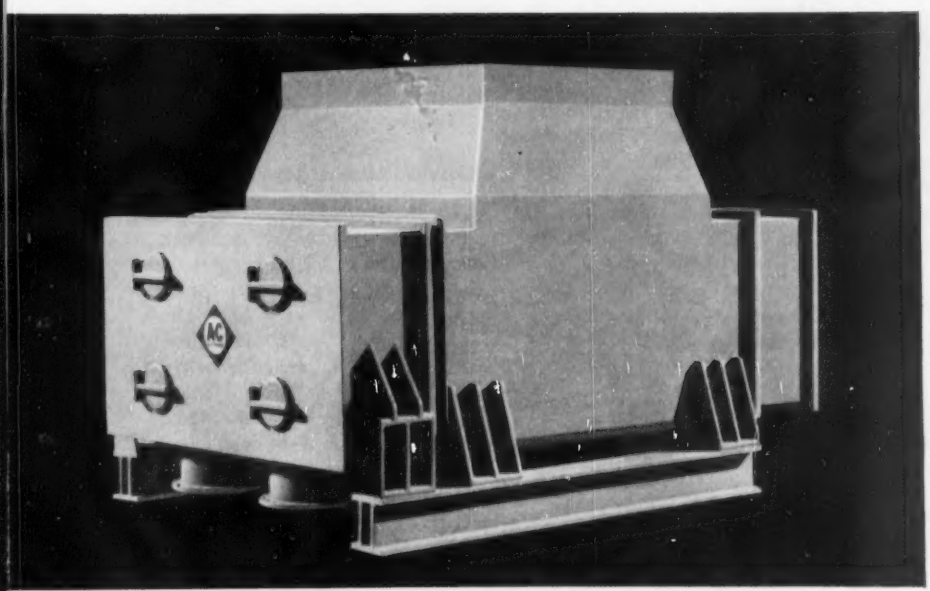


New Simplicity! *Pneu-Draulic* operating mechanism for breakers utilizes hydraulic principle instead of air. This reduces dirt and moisture hazards, adds reliability to breakers. These 115-kv breakers with *Pneu-Draulic* operators have been in service more than a year.

Developments



A Look At Tomorrow!
This 5000-kva power transformer, designed for 600 or 800-kv service, was built to help advance engineering knowledge toward possible future requirements.



Space-Saving Condenser! Latest 100,000-square-foot condenser, now being built, illustrates trend to rectangular shape, which permits savings in plant construction cost. Model allows unusual view of unit. This condenser features multi-steam path design for low "terminal difference," high condensate temperature and low absolute pressure.

A-4484

CHALMERS

VARIOUS SEGMENTS OF INDUSTRY were represented at unveiling of EEI's coordinated campaigns; Col H. S. Bennion of EEI, left; Robert Fite, Florida P&L; J. H. Jewell, of Westinghouse Electric Corp, NEMA president; and Norman Wicks, National Adequate Wiring Bureau

EEI Adds Housewares to '55 Campaigns

Electric housewares have been added to the list of appliances to be promoted in Edison Electric Institute's coordinated appliance campaigns for 1955.

As outlined by EEI's Residential Promotion Committee, next year's campaigns will include electric ranges, water heaters, freezers and clothes dryers in addition to the houseware items. Each campaign, calendared for a specific time of the year (see table below), will tie-in with the general industry slogan, "Be Modern . . . Live Electrically." A display kit and consumer folders for local promotion in each campaign will be available from EEI and other participating organizations. Details of individual campaigns will be mailed approximately three months before each campaign begins.

The program, now entering its third year, is the result of industry agreement that local promotions without national themes and timing result in scattered fire. Using EEI materials as a focal point, utilities, manufacturers, dealers, distributors and electrical leagues will again be encouraged to conduct local campaigns.

R. L. Coe, Residential Promotion Committee chairman, said the coordinated program makes it possible for all segments of the industry to promote "the same appliances at the same time," thus achieving greater impact. He pointed out that the local utility must provide the leadership in carrying out the campaigns.

In addition to those listed in the table below, four other major appliances are included on the 1955 coordinated appliance calendar. The committee urged their promotion although no special materials will be available. They include dishwashers and disposers in the autumn months; air conditioners and dehumidifiers in the summer.

Here's EEI 1955 Coordinated Campaign Calendar

Appliance	Theme	Time
Clothes Dryers	World's Greatest Wife Saver	January-February-March
Ranges	Cook Electrically—It's Clean	March-April-May
Water Heaters	It's Tops—Your Electric Water Heater	March-April-May
Freezers	Buy A Food Freezer Now and Save	May-June-July-August
Ranges	(to be announced)	Sept-October-November
Housewares	(to be announced)	June and December

Hartford Joins Electric House Heating Parade

Latest to join the ranks of power companies promoting electric house heating is the Hartford Electric Light Co. The activity got off to a flying start with a "dinner forum" Sept. 30 attended by 190 electrical contractors, dealers, distributors, and others interested. Theme of the meeting was how to sell space heating, with representatives of seven manufacturers telling the "how". A. J. Sbare, Sbare Automatic Heat, told the story for Wesix; Walter McNellan for Continental Radiant Glass; George Andreas, Dittman & Greer, Inc, for Chromolox; Paul Hawkins, for Electromode; John Riley, Paley Mfg Co for Circle-Aire; Lester Frank, Harold L. Frank & Sons for Berko; Francis H. Boole for Electriglas.

The meeting, under the direction of J. B. C. Thomas, Hartford Electric Light, opened with a resume of progress in space heating by W. S. "Steve" Leffler, W. S. Leffler Engineers Associated. It closed with remarks on the future of this developing service of electricity by Frank Innes, Electrical World. In response to a question from the floor, Mr Thomas said that the company had under consideration a rate option by which the cost of electric heat might under certain conditions be reduced to 2.1¢ per kwhr from the low step of 2.5¢ in the residential schedule.

Dishwashers like vacuums?

Virginia Electric & Power Co is urging dealers to use live demonstrations of electric dishwashers in their stores. Vepco feels the technique, used so successfully in selling vacuum cleaners (tossing dirt on the floor and having prospect watch appliance clean it up), can be applied to dishwashers.

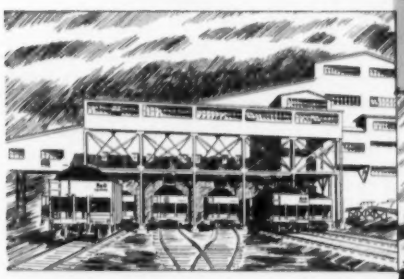
One of the biggest homemaker objections to electric dishwashers is the idea they don't really save any time. A recent study by the Ohio Agricultural Experiment Station showed that the appliance cut dishwashing time by 51.3%. In test, homemakers spent an average of 35.6 min per day cleaning dishes with the dishwasher as against 73.2 min by hand.

Are you keeping FUEL COSTS as low as you can?

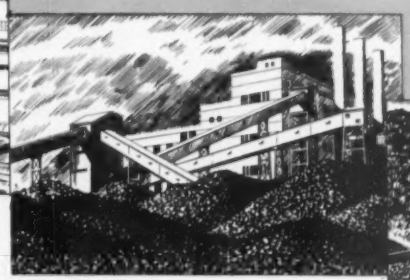
ASK OUR MAN!

He will demonstrate with *facts* why your best bet is bituminous coal. He will help you find the right kind and size of coal for your specific need; and he will show you up-to-the-minute ways of burning it efficiently and economically.

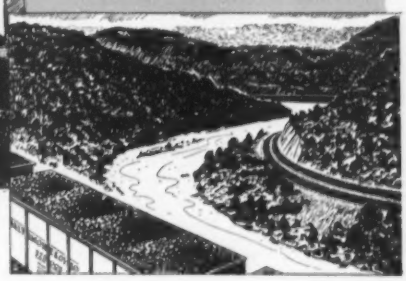
In Baltimore & Ohio territory, close to industry's doorstep, are bituminous coals in all varieties—for power, coking, steam, heating. Produced in highly mechanized mines, these coals are low in cost and uniform in size and quality. With the modern burning equipment now available, the efficiency and cleanliness of bituminous coal will amaze you!



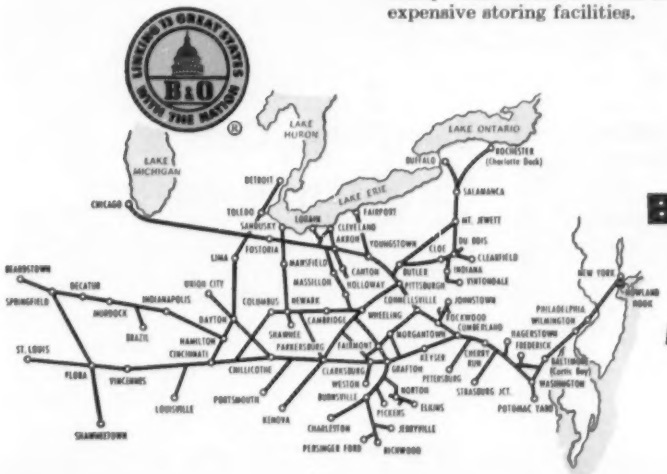
Surprising economy. Conveniently accessible and highly efficient in modern use, bituminous coal from mines on the B&O keeps fuel costs low.



Convenient storage. Bituminous coal can be stored anywhere with safety. This eliminates the need for expensive storing facilities.



Reserves for centuries. Plants built for bituminous coal are assured a continuity of fuel supply regardless of emergencies. On the B&O alone, are reserves estimated at 25 billion tons!



Baltimore & Ohio Railroad

Bituminous Coals for Every Purpose

EMPLOYEES from every Louisiana P&L department found prospects, gave leads to electrical dealers in company's range-water heater campaign. Some 1,357 units were sold in six weeks

Want Bigger Sales? Use Employees

JAMES E. FORT, Louisiana Power & Light Co., New Orleans, La.

Combine proper promotional techniques with employees who will get in and pitch—not only those in the Sales Department, but others, too—and you'll find yourself selling goods at a rate that exceeds all expectations.

By using just such a formula, Louisiana Power & Light Co. sold 1,357 electric ranges and water heaters and upped its annual revenues an estimated $67,000 in a recent "Business Builders" campaign.

Some 730 ranges and 627 water heaters plus 876 kw of commercial electric counter cookery were sold through dealers in the eight-week campaign. It followed a similar "Ice Breakers" promotion run last winter in which the company sold 756 electric ranges.

Aside from buying appliances themselves (they bought 437 ranges, 43 water heaters), company employes turned in 2,762 prospect cards to dealers, many of which resulted in sales. Teamwork was the rule everywhere. For instance, in one district a meter repair man, after talking to a lady who was about to buy a new range other than electric, called the district sales representative with the tip. Minutes later the representative was at her house. The lady bought an electric range.

Employes had strong sales aids behind them in their individual customer contacts. An advertising schedule in 47 newspapers was used with local dealer tie-ins. Several papers published electric cooking stories. Radio spots, billboards and a weekly TV show in Monroe gave added punch. A booklet, "ABC's of Electric Cooking", was mailed to all residential and farm customers.

No more electric cooking campaigns are planned this year, but the company is counting on its greatest asset—its own employees' enthusiasm—to continue to keep the sales curve up and the electric cooking load growing.

S & S Shorts

Carolina Cooking Drive Ups Load

Some 6,877 kw (212% of quota) was added by Carolina Power & Light Co after a four-month Commercial Cooking Profit-Builder Campaign. New load represents $138,000 in estimated annual revenue or 99% of company's annual revenue quota for commercial cooking.

Another Wiring Ally

"Look" magazine will carry adequate wiring story, "Watch Your Wiring," in its Nov. 2 issue out Oct. 19. Story pictorially shows growth in number and wiring requirements of home appliances since 1930. "Look" plans to follow up with wiring promotion program on local level.

5,000 Ranges by Nov. 30

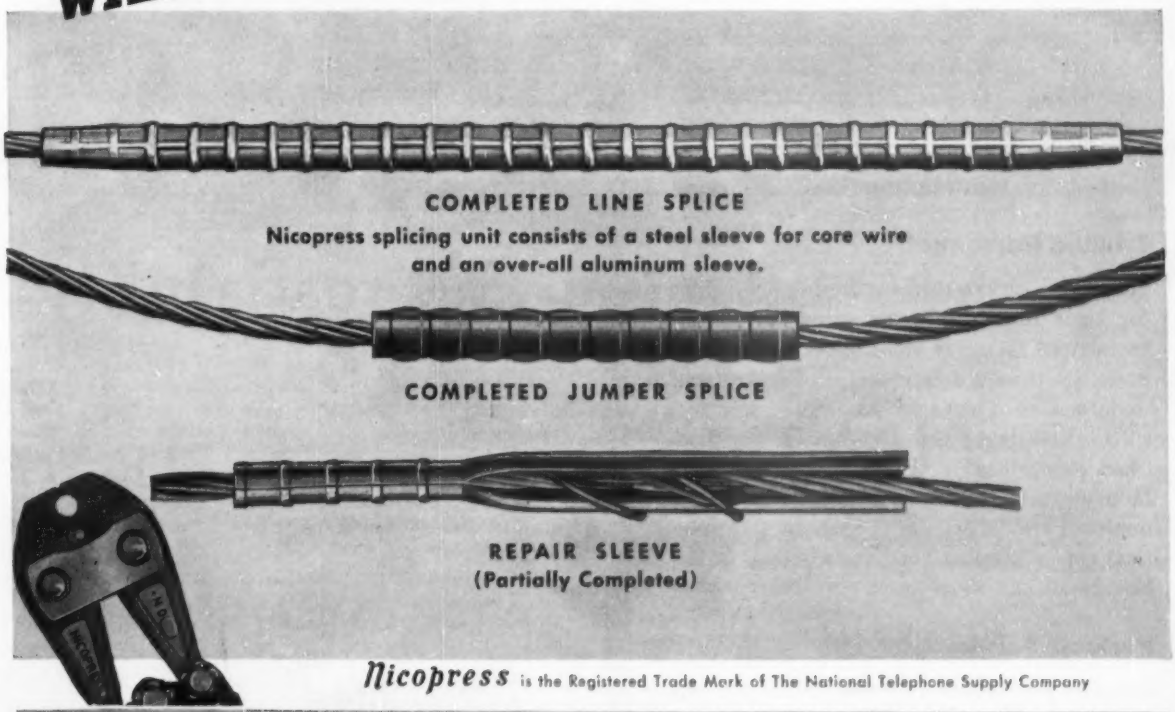
A goal of 5,000 electric ranges and $1.25 million in sales has been set by Florida Power & Light Co in new Diamond Jubilee Electric range campaign. Variety of dealer aids plus a heavy FP&L advertising schedule will be used.

San Diego Gets "Brightest Broadway"

"Brightest Broadway in America" is what local citizenry calls San Diego's street of the same name after installation of a new mercury-vapor lighting system. Street's illumination was boosted five times when 5,000 people watched Miss San Diego pull switch in special Light's Diamond Jubilee observance. The 16-block section of new lighting consists of 81 units mounted on steel poles and upsweep brackets. Turning on ceremony was sponsored by San Diego Gas & Electric Co and the city's Downtown Association.

Nicopress SLEEVES for A·C·S·R·

WILL GIVE YOU PEAK PERFORMANCE!



COMPLETED LINE SPLICE

Nicopress splicing unit consists of a steel sleeve for core wire and an over-all aluminum sleeve.

COMPLETED JUMPER SPLICE

REPAIR SLEEVE
(Partially Completed)

Nicopress is the Registered Trade Mark of The National Telephone Supply Company

The National Telephone Supply Company

5100 SUPERIOR AVENUE • CLEVELAND 3, OHIO

Canadian Mfr.—N. SLATER CO., LTD., HAMILTON, ONT., CANADA

Export Distributor—INTERNATIONAL STANDARD ELECTRIC CORP., NEW YORK, N. Y.

THE NATIONAL TELEPHONE SUPPLY COMPANY

When you need instrument service . . .

Ever have a tire blow out while you're traveling late at night? If it happens near a service station, you're lucky. But if it's on a lonely road far from town, you've got trouble.

When it comes to service on instruments, you don't need to take chances on being lucky. Because when you have Honeywell instruments, you've always got the comfortable feeling that service is close at hand . . . whenever and wherever you want it . . . from the world's biggest instrument service organization.

Over 110 Service Centers

No matter where you may be, there's a Honeywell service man near you. Offices are located in more than 110 cities of the United States and Canada, near every large production center.

When you run into trouble, just telephone or wire the nearest of these offices. You'll get a service specialist promptly . . . often within a few hours. This quick attention to your needs protects your production schedules, and prevents delays that can cause costly stoppages.

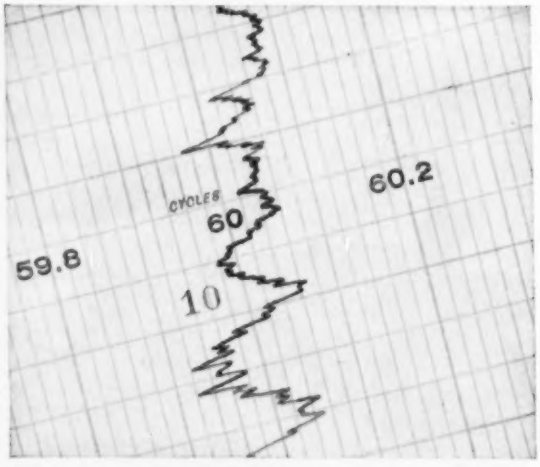
Trained Personnel

Honeywell service men are thoroughly trained for their important responsibilities. In the Honeywell factories, hand-picked men learn both the theory and practice of instrument maintenance. Then they serve an apprenticeship in the field offices, to gain further first-hand experience. You can be sure that the Honeywell man who calls at your plant is a qualified specialist, well versed in the practical art of keeping good instruments in the best condition.

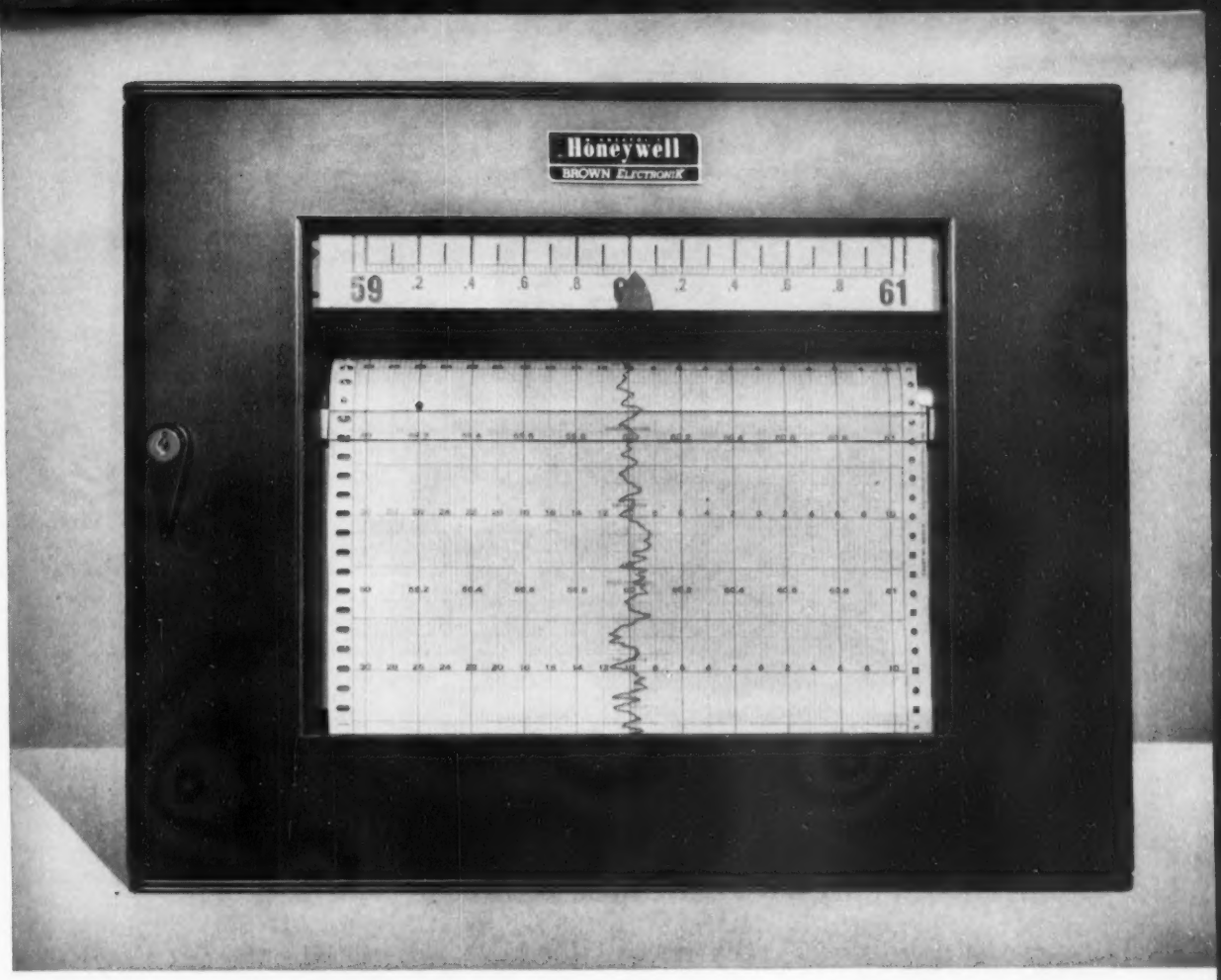
Periodic Service

But why wait for emergencies—when you can prevent them with periodic service. Under a simple contract, a Honeywell man will visit your plant at regular intervals to inspect, clean and adjust your instruments and controls. The plan is economical, and can save you hours of production time. Our nearby branch office will be glad to give full details on Honeywell Periodic Service.

New *ElectroniK* recorder brings greater precision and readability



Full size section of chart shows the detail of record obtained with the new high precision, high sensitivity ***ElectroniK*** *frequency recorder.*



to frequency measurements

BY MEANS of the new *ElectroniK* frequency recorder, load dispatchers can now have a clearer, more accurate picture of system frequency as a guide to regulating generation and interchange. A new pulse-type measuring circuit . . . in conjunction with electronic "Continuous Balance" measurement . . . brings greater precision and speed than ever before to frequency recording.

Better readability is made possible by this highly sensitive instrument. The range from 59 to 61 cycles, for example, is spread across 11½ inches of calibrated chart and scale.

Unaffected by wave form and temperature—inaccuracies of earlier bridge-type circuits are eliminated.

Rapid response—electronic balancing circuit keeps in step with quick changes in frequency that mechanical instruments cannot follow. Pen speeds of 12 and 24 seconds full scale are available.

High precision—new circuit has more than double the accuracy of previous types. Overall accuracy is ±0.01 cps.

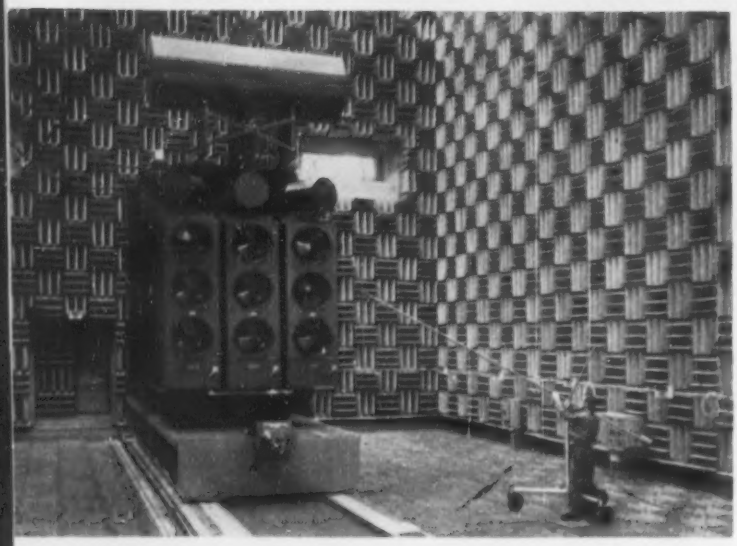
A choice of ranges for both 60 and 50-cycle systems is available. The new instrument is readily adaptable to automatic load and frequency control systems, operating in conjunction with existing electronic or mechanical instruments.

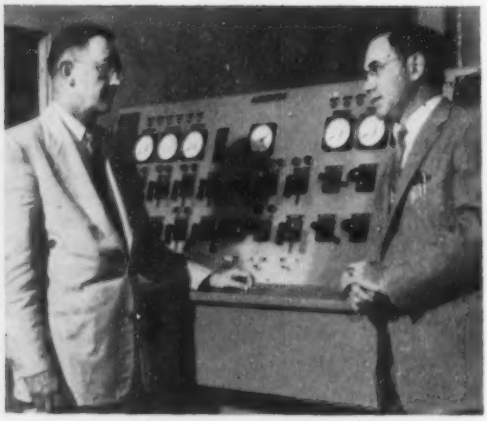
Your nearby Honeywell sales engineer will be glad to discuss applications to your own power system. Call him today . . . he is as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.

● **REFERENCE DATA:** Write for Data Sheet No. 9.1-8a, "*ElectroniK* Frequency Recorder."

MINNEAPOLIS
Honeywell
BROWN INSTRUMENTS
First in Controls





CONTROL PANEL for power (above) and control panel containing measuring instruments are in separate room

ANECHOIC CHAMBER for testing transformers is almost four stories high. Chamber sound level is less than 20 db

GE Opens Large Sound Laboratory

New $1,500,000 sound laboratory with the world's largest anechoic chamber has been built by General Electric Co's Power Transformer Department, Pittsfield, Mass. The laboratory, to be used for research on the sound produced by power transformers, was dedicated Oct. 13.

Recognizing the growing problem of the sound level of transformers in suburban areas, GE hopes data obtained in the new laboratory will contribute to the solutions. This is believed to be the only anechoic (without echoes) chamber built for testing the giant-sized power transformers.

The chamber is 58 ft long, 48 ft wide, and 43 ft high, measured to the tips of the fiber glass wedges. Noise and vibration measurements in the anechoic chamber will be accurate to ½ db. Noise or sound level in the chamber is less than 20 db.

To obtain the low sound level, this laboratory has walls nearly 5 ft. thick. Each wall has 12 in. of concrete, 2 in. of fiber glass, 8 in. of concrete blocks, layer of copper sheathing, dead air space, and fiber glass wedges.

Purpose of the copper sheathing is to obstruct radio frequencies so that tests can also be made on transformers for radio and television interference.

More than 12,000 wedges are used in the walls and floor of the anechoic chamber. Each wedge, made of fiber glass enclosed in a wire screen, is 28 in. long. There are 3,884 sets of wedges on the walls. Each set consists of three wedges. There are also 168 sets of portable wedges to cover the railroad tracks that extend the length of the room. Total sets of wedges are over 4,000.

The two doors, each weighing 30 ton, are structural steel and have two compartments—outer one filled with sand, and the inner one with fiber glass. In addition, the doors have 28 in. of wedges. Doors are sealed shut by inflatable rubber gaskets which wedge themselves between the doors and the adjacent walls when filled with air.

Floor of the chamber is a trampolin-type arrangement. Interwoven 3/32-in. aircraft cable is anchored on 2-in. centers by 450-lb springs. The wire floor is suspended 6-in. above the floor wedges. A specially designed transfer car will haul transformers into the chamber on railroad tracks.

Three 3,333 kva transformers with taps from 2,300 to 69,000 v will supply test power. They are located in a separate room. Two control panels have windows enabling an operator to look into the chamber.

General Electric Co recently complete another sound laboratory at Danville, Ill., for testing and calibration of noise levels on ballasts for fluorescent lighting. It will be used to maintain quality on current production and to check noise levels on new and experimental ballasts.

Stanford Research Institute Opens Honolulu Office

Stanford Research Institute is establishing a project office with resident staff in Honolulu, Hawaii. The initial operating staff will be headed by William E. Hosken, economist and manager of company development research. An economist, a senior scientist in chemistry, a research assistant, and a secretary will complete the basic staff.

An initial interest of the new office will be to assemble information about Hawaii to be incorporated in the Western Resources Handbook, a public service activity of the institute. SRI was founded in 1946 to promote the economic progress of the West. Its staff of 840 is now doing contract research for industry and government at an annual rate in excess of $8 million. SRI has offices or laboratories in five western cities and Washington, D. C.

(*More M & M on page* 193)

The new Westinghouse *Lifetime* meter

The one meter for all present and foreseeable future single-phase loads that can be metered without an instrument transformer.

Read on the next three pages why we can offer this new meter with a 30-year Lifetime guarantee. Then, on the following four Trans-Vision pages, for the first time in an advertisement, you can take a meter apart piece by piece and see for yourself how it is made.

Five vital factors that make this a *Lifetime* meter

There are five major factors that determine the life of a watthour meter. The superiority of the DS and DA meters on these points assures Lifetime performance. These points are:

1. Range—sufficient load range to take care of present and future loads. Range means, simply—how wide a range of loads the meter can measure without any loss in accuracy.

2. Thermal capacity—the ability to give good service and long life at extreme temperatures and high overloads. Thermal capacity is achieved through better connections, heavier wire and better insulation.

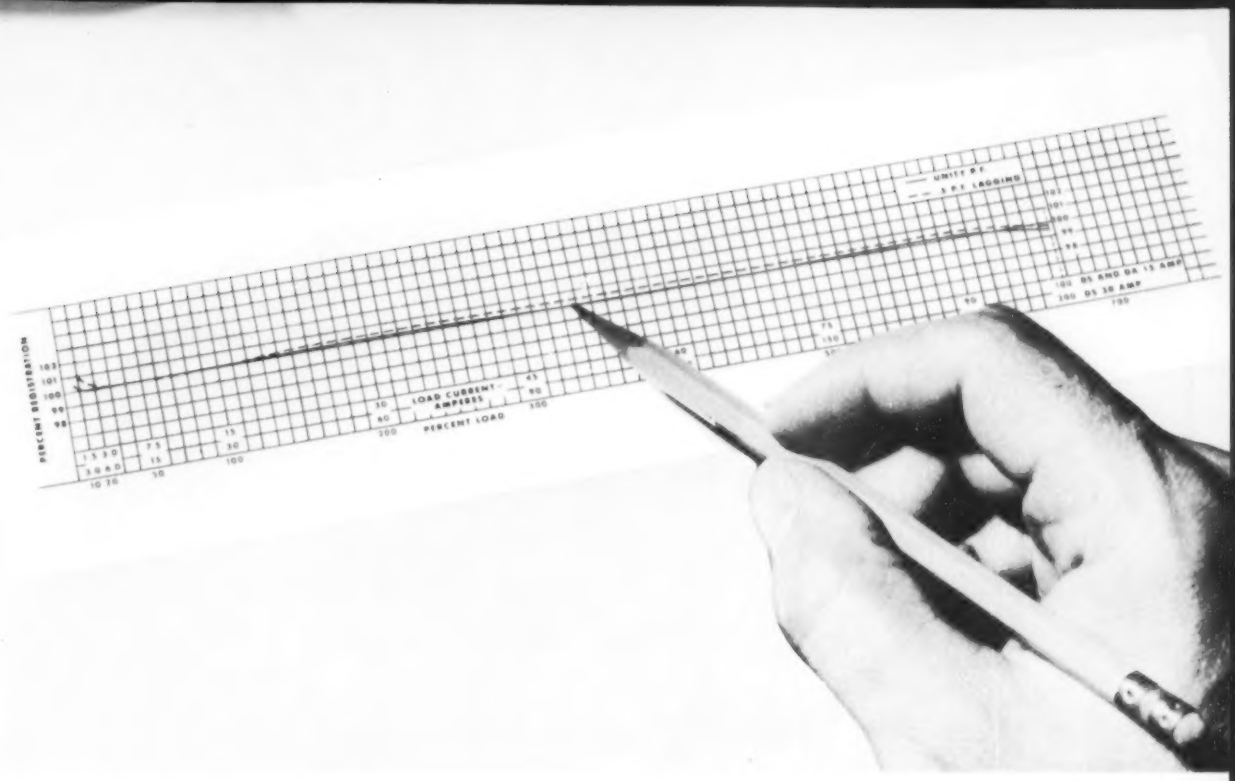
3. High insulation level—the ability to withstand high-voltage surges without damage. This factor is becoming increasingly important as the current trend to suburban living means more and longer lines to outlying areas where exposure to lightning is more of a problem.

4. Stability—long-time accuracy of a meter is possible only when the meter is inherently stable—mechanically, electrically and magnetically.

5. Corrosion protection—all materials and finishes must be selected and coordinated to give maximum protection against corrosion for long life, low maintenance.

Read on the next two pages how the Lifetime meter is superior on these five vital points ⟶

YOU CAN BE **SURE**...IF IT'S



You get straight-line accuracy to 667% of rating

Range

Electric utilities are now faced with the necessity of replacing many old meter installations because they do not have the range required for modern loads. For the replacement of such meters and to provide for any single-phase metering requirements in the foreseeable future, Westinghouse has introduced the Lifetime meter—a meter with a truly amazing range.

This new meter is available in socket and bottom-connected construction to measure loads accurately from less than 0.1 to 100 amperes. It is also available in another rating in socket construction for accurate measurement of loads up to 200 amperes. This range is sufficient for all present and foreseeable future loads, except those requiring an instrument transformer. As evident in the load curve above, Lifetime meters give straight-line accuracy over their entire range.

While no one can predict the future, it seems reasonable to say that when loads do grow beyond the range of the Lifetime meters, they will cease to be single-phase loads. This new meter provides adequate insurance against obsolescence due to accuracy and load range.

Thermal Capacity

Superior thermal capacity is achieved in the Lifetime meter through the use of wire with more current-carrying capacity, by using brazed connections instead of screw connections, and through the use of improved insulating materials. The industry requirement for a 100-ampere meter will not permit a temperature rise above 55° C at maximum load. The Lifetime meters are not only well within this limit, but are built with insulation that can take even greater temperatures than the limit allows!

Turn the page for more reasons why this new meter gives Lifetime performance ——→

Westinghouse

★ **High insulation level**

★ **Stability**

★ **Corrosion protection . . .**

. . . Vital factors that mean long meter life

High Insulation Level

Both the current and the potential coils have a 15,000-volt impulse insulation level. Additional surge protection is provided by De-ion® gaps which discharge at 4500 volts, well under the 15,000-volt impulse insulation level of the coils.

Stability

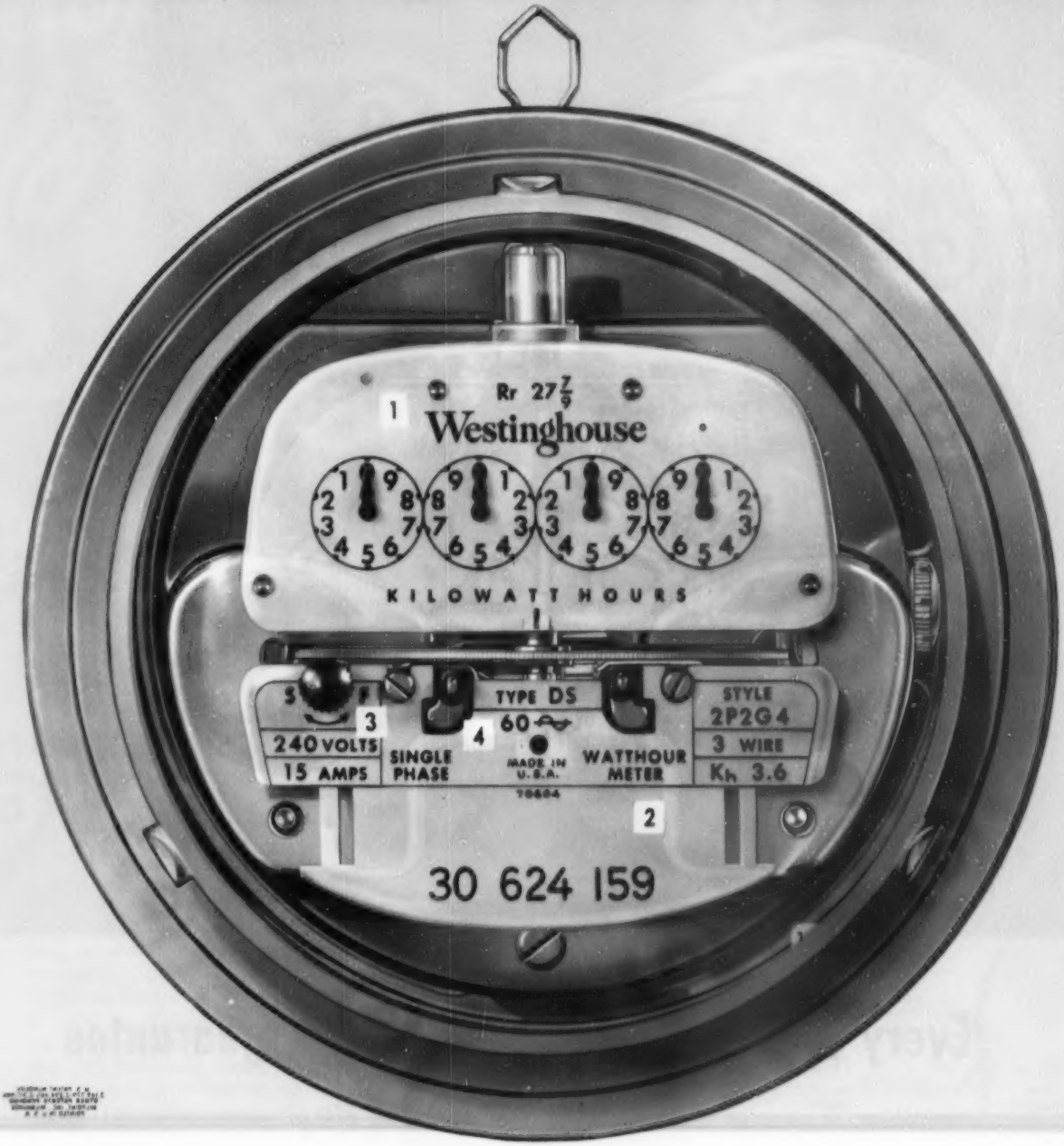
The Lifetime meter is designed mechanically, electrically and magnetically for accuracy and stability under all conditions. It has the kind of stability required for *long-time* accuracy.

Corrosion Protection

Every component in the Lifetime meter is built to resist corrosion. Tests show that all parts of the meter have maximum corrosion protection.

See for yourself why this new meter gives Lifetime performance.

YOU CAN BE **SURE**...IF IT'S



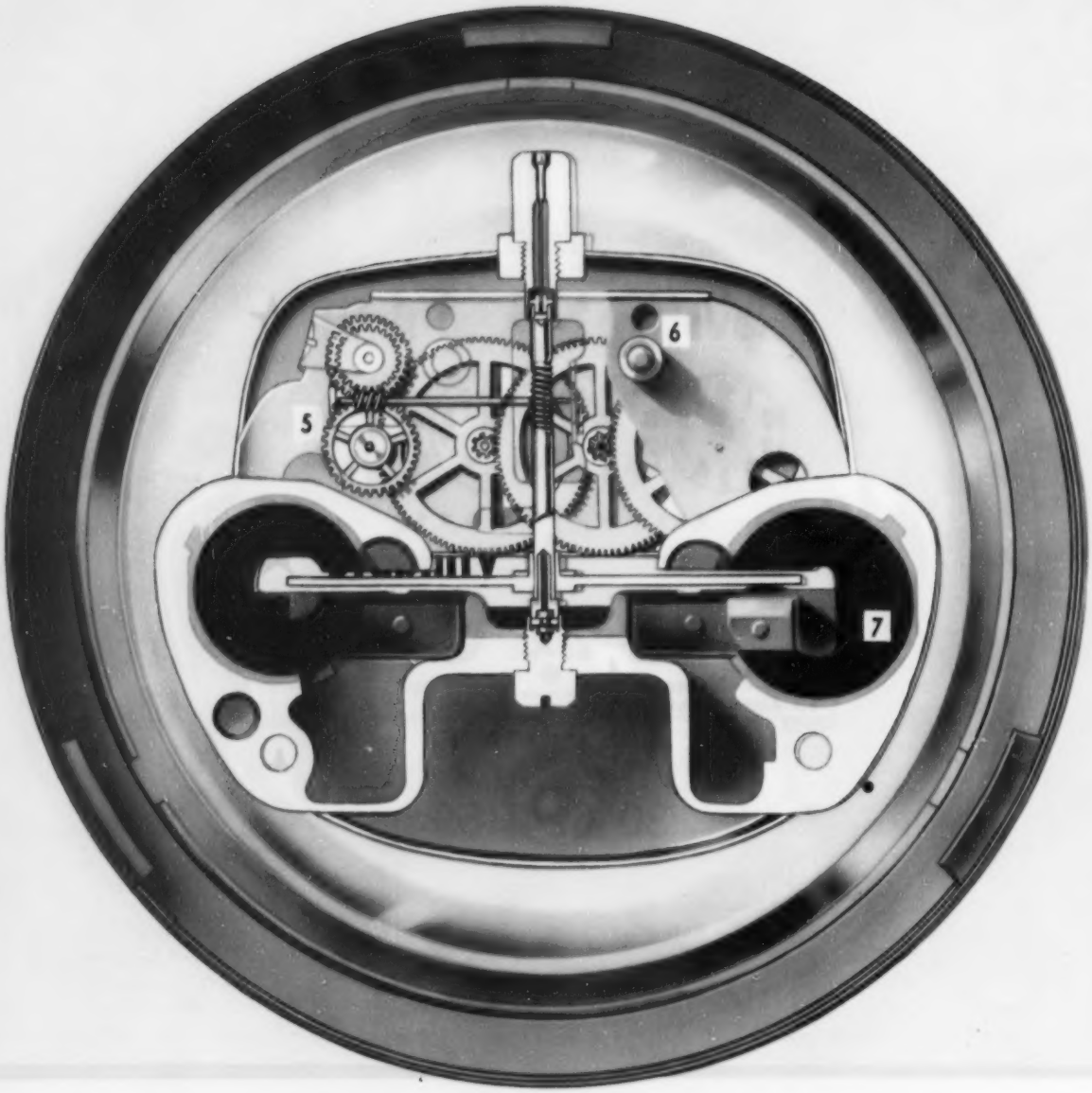
1. THE FINISH on the register dial of the Lifetime meter is baked methacrylate resin that stays white under all conditions. Dial will not crack, discolor or chip. It is impervious to heat, cold, humidity and corrosive atmospheres.

2. NAMEPLATE has same durable finish as the dial. It is separate so meter keeps its identity, even if register is changed. Ample space is available for mounting various types of utility identification. Extra-heavy construction of nameplate prevents accidental damage. The serial number on the Lifetime meter is larger, easier to read.

3. FULL LOAD ADJUSTER is spring loaded, can be operated by hand or screw driver. Both the light load and full load adjusters are linear, 1% per turn, ± 10% range. This range of adjustment assures interchangeability of electromagnets.

4. DISC GUARDS are cast into the frame to prevent disc damage when the meter is laid on its face during inspection or maintenance.

Westinghouse



5. GEARS AND SHAFTS in the register are precision made, accurate. The plate construction of the register provides rigid support and permanent alignment of the gears. Registers are protected from corrosion through the use of iridited aluminum plates and gold-finished shafts and gears.

6. BAYONET MOUNTING of the register gives it rugged support. Precision machining of these supports assures correct alignment, eliminates any need for adjustment of register mesh.

7. FOR ADDITIONAL MECHANICAL AND ELECTRICAL STABILITY, damping magnets of Alnico are mounted in the aluminum frame. There is no change in calibration from a 40,000-ampere, 20 x 50-microsecond wave.

YOU CAN BE **SURE**...IF IT'S

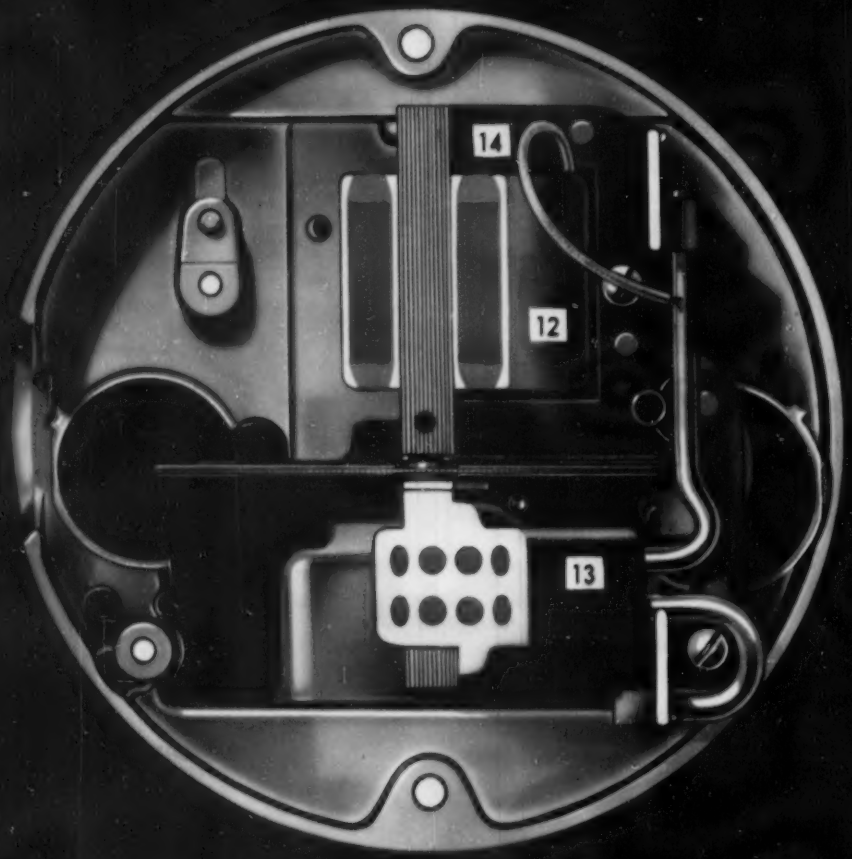
8. THE HEAVY DIE-CAST ALUMINUM FRAME provides rigid and accurate support for all meter elements.

9. FLEXIBLE UPPER GUIDE BEARING of hardened chrome steel fits into a non-lubricated, removable bronze bearing in the shaft.

10. BALL AND JEWEL BEARING, pioneered by Westinghouse in 1902, is the only time-proved Lifetime bearing. Utility records show that under normal conditions the life and performance of this bearing are practically unlimited.

11. BAYONET MOUNTING HOLES for register simplify mounting or removal.

Westinghouse

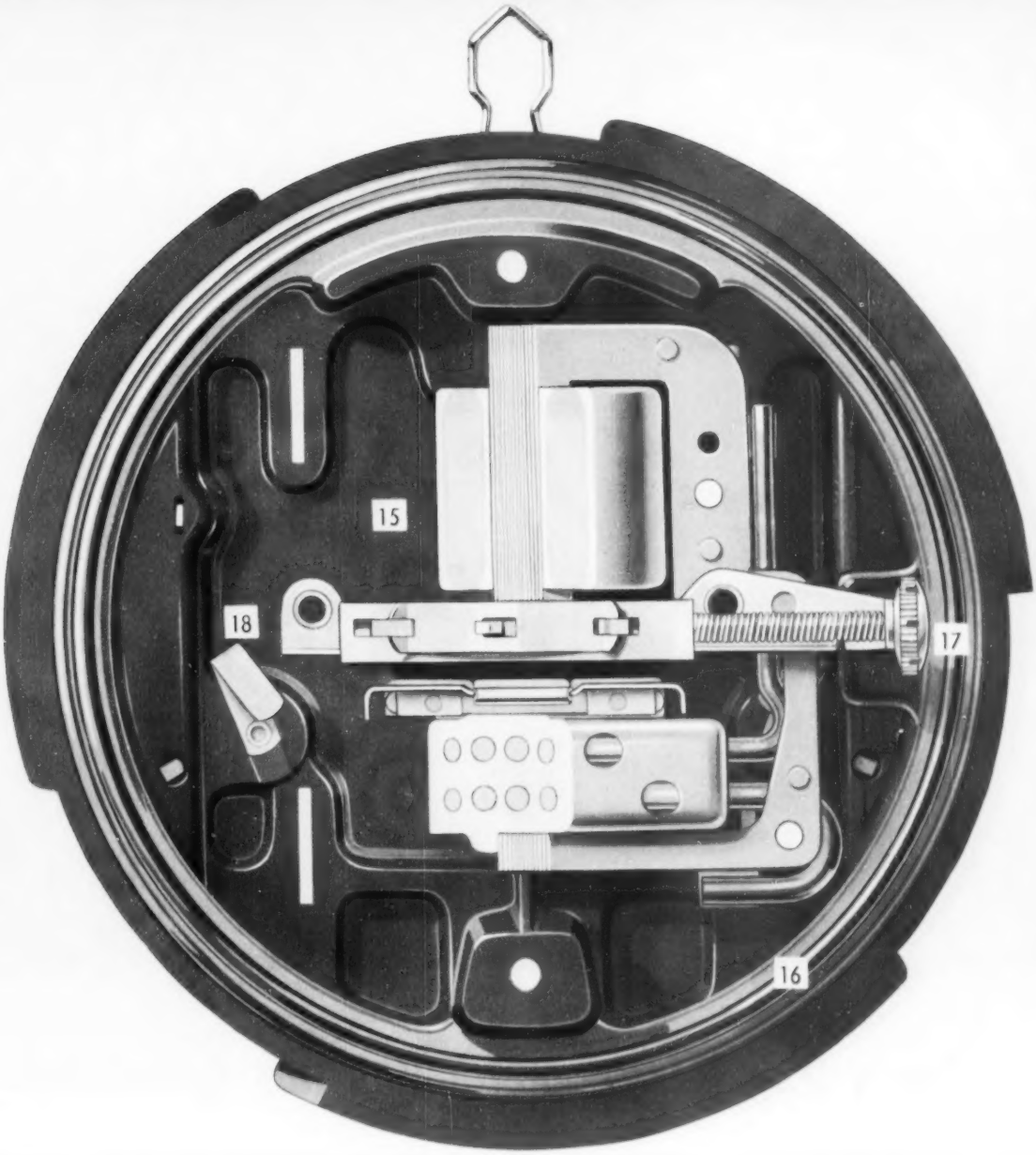


12. POTENTIAL COIL is vacuum impregnated with a time-tested thermosetting polyester resin which serves both as an insulation and a bond. Coil has a 15,000-volt impulse insulation level for greater safety and protection.

13. CURRENT COIL conductor is extra heavy. Coil is form wound, then a new polyester insulation is molded around coil and laminations. Impulse insulation level is 15,000 volts. Blades are brazed to coil leads for a permanent, solid connection. The insulation in both the current and potential coils does not deteriorate or give off corrosive fumes when subjected to overheating.

14. THE LAMINATIONS are made of a better grade of silicon steel. They are annealed, then Bonderized to resist corrosion. Laminations are riveted together at ten places to insure a permanently solid stack.

YOU CAN BE SURE...IF IT'S Westinghouse

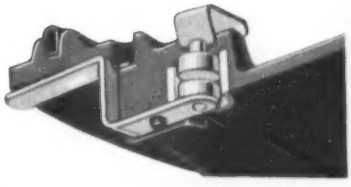


15. THE BASE is made of Moldarta*, a rugged thermosetting insulating material which not only withstands high voltage without breaking down but also gives off no corrosive vapors even when subjected to extreme temperatures.

16. A COVER GASKET of extruded tubing is recessed into the base so as to compress and hold itself snugly in place.

17. LIGHT LOAD ADJUSTER is located on the side of the meter. It is also spring loaded and can be operated by hand or screw driver from side or front of the meter.

18. SPRING CLIPS make contact with the current coil leads. Surges are conducted through these clips to De-ion arrester gaps.



*Trade-Mark

These De-ion gaps discharge outside the meter at 7000 volts impulse, well under the 15,000-volt impulse insulation level of the coils. Ground straps in the back of the base are replaceable without removing the cover, if they are burned by repeated surges. However, the De-ion principle minimizes burning of the contacts by repeated surges.

Every *Lifetime* meter has this guarantee

Westinghouse, in connection with Type DA and DS meters, will replace any defective part which fails under proper and normal use during the life of the meter which, for the purpose of this guarantee, is thirty (30) years from date of shipment. The replacement part will be shipped prepaid, and such shipment shall fulfill all Westinghouse obligations in respect to said meter. Westinghouse shall not be liable for consequential damages.

This outstanding guarantee is possible because Westinghouse has designed and built the five factors of range, thermal capacity, high insulation level, stability, and corrosion protection into its Lifetime meter.

This meter will give you safe, dependable, Lifetime performance. It will measure the growing residential loads of today and tomorrow—accurately, economically.

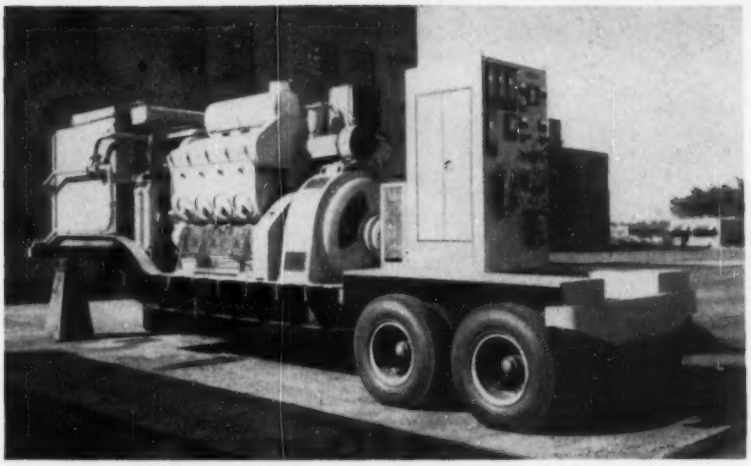
To get top meter performance, specify the new Westinghouse Lifetime meter. For additional information, contact your Westinghouse representative or write Westinghouse Electric Corporation, 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pennsylvania.

YOU CAN BE **SURE**...IF IT'S

Westinghouse

CP-1025

Printed in U.S.A.



GM Announces Mobile Power Generators

The first mobile power generating equipment with all components designed and built by one manufacturer as an integrated unit was introduced Oct. 12 in a demonstration at La Grange, Ill. General Motors Corp's Electro-Motive Division engineered and built the units based on experience in building 15,000 diesel-electric locomotives. GM diesels of the 567 Series, which power the mobile generators, are in use in locomotives, marine, and stationary applications totaling over 26 million hp.

The units have been built for high efficiency, low initial cost, and reliability. Units of 350, 500, 750, and 1,000-kw capacity may be mounted on rail car, or units can be supplied skid mounted. The 350 and 500-kw units are also built on semi-trailers for road travel. Generators are 3-phase, 2,400 and 4,160 v.

Aluminum Production Up

U. S. primary aluminum production, according to the Aluminum Association, totaled 966,857 tons (2,000 lb) for the first eight months in 1954, up from 818,534 tons for the same period in 1953. Production was 125,296 tons during August, down from 126,167 tons in July, but up from 110,545 tons in August 1953. Aluminum foil shipments of 7,014 tons in August of this year, is an all-time high.

ALCOA Develops ACSW

Research and development by Aluminum Company of America has resulted in the successful production of aluminum clad steel wire—ACSW. It has been produced on an experimental basis and the company is preparing for its commercial production.

The new wire has been tested in the field as the neutral in self-supporting service drops. Used as the neutral in this application, it can be readily wrapped around itself at terminal points. Use is also expected in the utility and communications fields for this strong, easily-worked wire. Its strength is claimed to be greater than alloys commonly used for electrical conductors.

IEC Classification Of Insulations

International agreement has been reached on revision of the classification of insulating materials for rotating machines and transformers, issued by the International Electrotechnical Commission (1935 Edition, Rule 34).

In addition to previous standards covering classes A, B, and C, new classes E, F, and H will be included. Maximum operating temperatures will be assigned to the various classes, which will be defined in broad terms. It is proposed to publish the new classification as a separate document applicable to all types of machinery and apparatus.

NOW

SEYMOUR SMITH presents

PRUNING SAWS

that CUT FASTER LAST LONGER

No. 922

No. 622

No. 514

Specially designed for arborists and other professional users. A complete line of 7 patterns covering all requirements up to chain saw work.

Blades — made by Sandvik of famous Swedish charcoal steel — have fast-cutting, large, deep teeth with heavy set to prevent binding. Handles are of laminated hardwood, streamlined and free from horns and projections.

also LOPPING SHEARS

5 patterns in various sizes, including the new Seymour Smith TIFFANY PRUNER.

TREE PRUNERS

No. 11 Pruner Head

No. 11 "Telephone" tree pruner head, with 1" capacity and No. 12 with 1½" capacity are the finest available. Also rugged poles of selected spruce with seamless aluminum joints.

POLE SAWS

No. 20 Saw Head

No. 20 saw head has 16" needle point teeth, is adjustable to 3 positions. Uses standard poles.

PRUNING SHEARS

No. 90 Professional Double-Cut

For generations Seymour Smith has been supplier of the finest hand pruners for professional use. Made in 8 models for all requirements.

Most dealers carry Seymour Smith pruning equipment. Write us for descriptive literature.

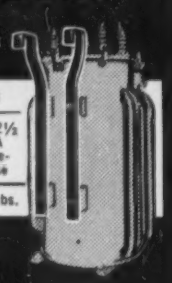
SEYMOUR SMITH

OUR 104th YEAR

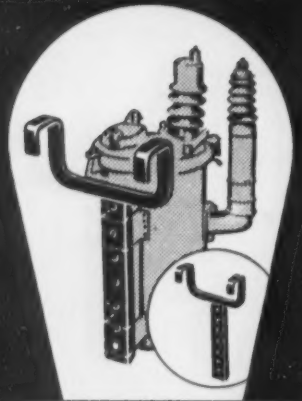
SEYMOUR SMITH & SON, INC.
42410 Main St., Oakville, Conn.

THIEL
TRANSFORMER HANGERS

MODEL	C-1	C-3
TRANSFORMER	75-100 KVA Single-Phase	75-112½ KVA Three-Phase
WEIGHT	46 lbs.	100 lbs.



Thiel Hangers, made according to NEMA specifications, are hot-dip galvanized to insure dependable service. In two styles, complete with galvanized bolts and nuts.



MODEL	1-PHASE	3-PHASE	WEIGHT
T-1	3-15 KVA	9 KVA	16¼ lbs.
T-2	25—37—50 KVA	15-45 KVA	37¼ lbs.

Hangers and Kickers *in Stock!*

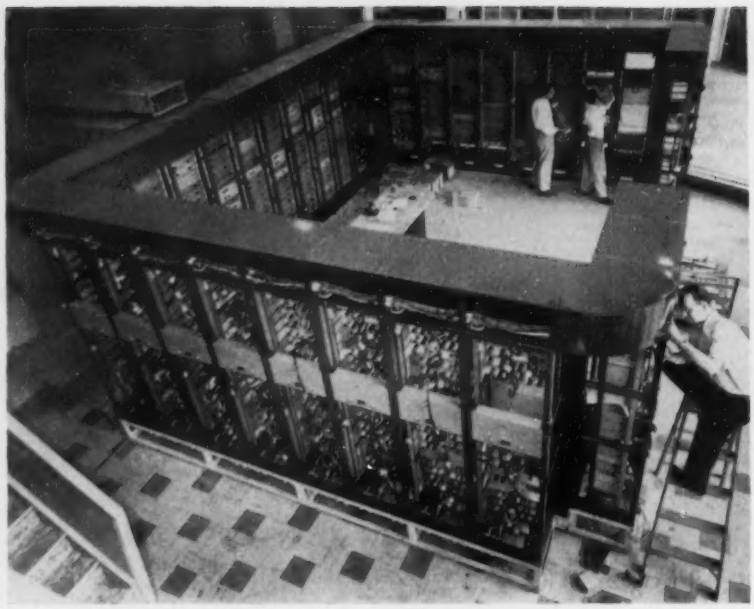
HANGER KICKERS

MODEL K-1, which can be mounted in four different positions, is designed for use with T-1 Hanger shown above. MODEL K-2, for use with T-2 Hanger, has five mounting positions. Kickers, bolts and nuts are hot-dip galvanized.

Electrical Fasteners That Hold . . .

THIEL TOOL AND ENGINEERING CO.

1417 No. Market St. • St. Louis 6, Mo.



Burroughs UDEC II Computation Center

Electronic Instruments Div, Burroughs Corp is operating a computation center at 1209 Vine St, Philadelphia. The UDEC II (Unitized Digital Electronic Computer) is the central computing element. Among the applications are studies of networks and transmission losses, also developing new methods of analysis. The UDEC I, a somwhat slower computer, is at Wayne University, Detroit.

Unitized, or building block construction, chassis and panels are connected together into a logical system of computation. This type construction permitted building the computer in only three months.

MANUFACTURING BRIEFS

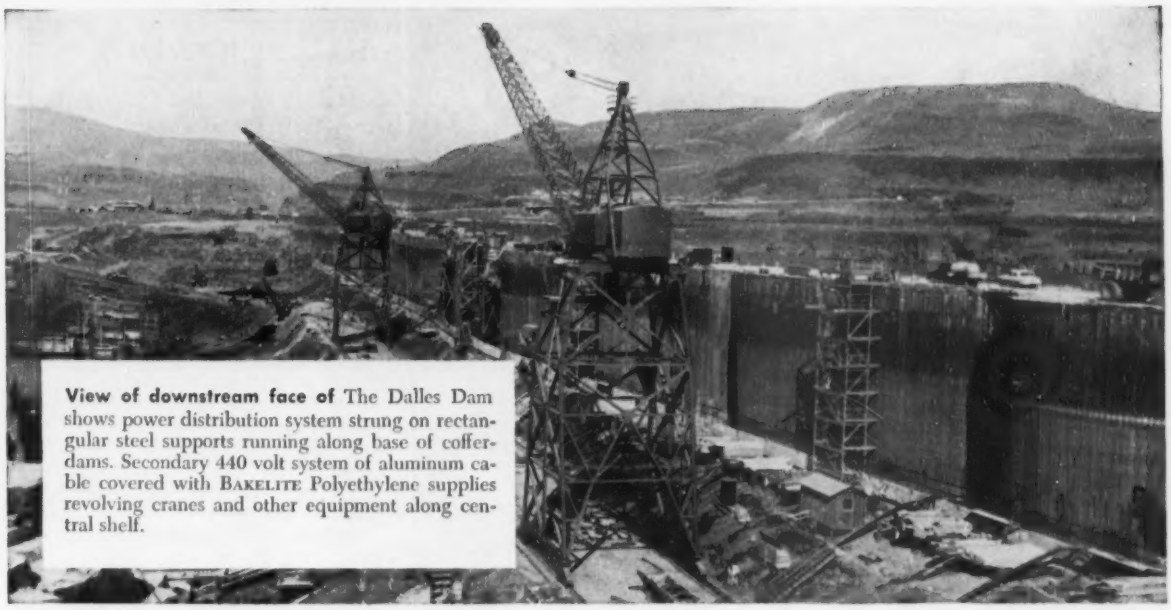
Robertshaw-Fulton Controls Co has opened a $1-million research center at Irwin, Pa. The Robertshaw Research Center is on a 9½-acre site purchased in 1952. Victor Weber, vice president and director of research and development, will make his offices at the center.

Minneapolis-Honeywell Regulator Co is reported to have purchased the assets of Heiland Research Corp of Denver. The latter will retain its name and be operated as a division of Minneapolis-Honeywell. Heiland, a 20-yr old company, produces scientific instruments and photographic flash equipment.

Rental plan designed to facilitate purchase of electronic test equipment is announced by Polarad Electronics Corp, 100 Metropolitan Ave, Brooklyn 11, N. Y. The plan allows lessee to conserve working capital. The rental fee, being a current expenditure, may constitute a tax-deductible item.

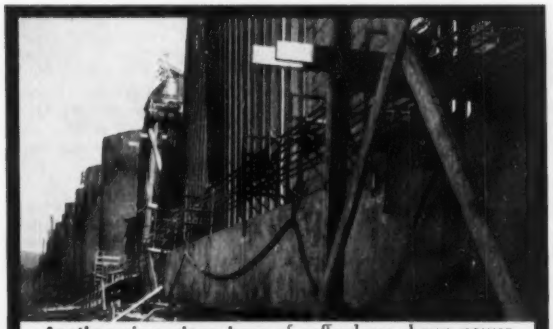
Bailey Meter Co has begun clearing a 50-acre site at Wickliffe, Ohio, for construction of a 225,000-sq-ft one-story plant to employ 200 persons, and to house the firm's main offices.

Allis-Chalmers Manufacturing Co profits for 1954 are expected to be a little more than the 1953 earnings of $6.58 a share. So far, sales are 2 or 3% under last year, attributed to lower defense contracts. Sales performance of Buda Co acquired last year prevented a larger decline. Improvements in profits is because of some tax relief, more favorable materials markets, and increased plant efficiency. Allis-Chalmers will benefit from an atomic energy project in Du Page County in Illinois, according to W. A. Roberts, president.

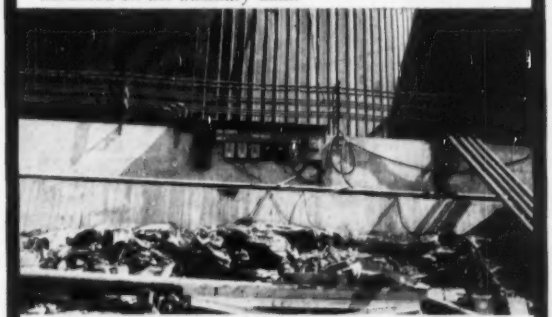


View of downstream face of The Dalles Dam shows power distribution system strung on rectangular steel supports running along base of cofferdams. Secondary 440 volt system of aluminum cable covered with BAKELITE Polyethylene supplies revolving cranes and other equipment along central shelf.

Why Polyethylene-Insulated Aluminum Cable Feeds This Dam's Construction Equipment



Another view along base of cofferdams shows power distribution system close up. Polyethylene covered aluminum cables are supported by rectangular brackets mounted on the auxiliary dam.



Two circuits of 1,590,000 circular-mil feeders, shown running horizontally along base of cofferdams, are constructed of 1¼" diameter polyethylene covered aluminum cable.

Electrically-powered equipment has to work hard on this big construction job—The Dalles Dam on the Columbia River. It needs service points along the power system to feed traveling cranes, arc welders, pumps, and lighting transformers.

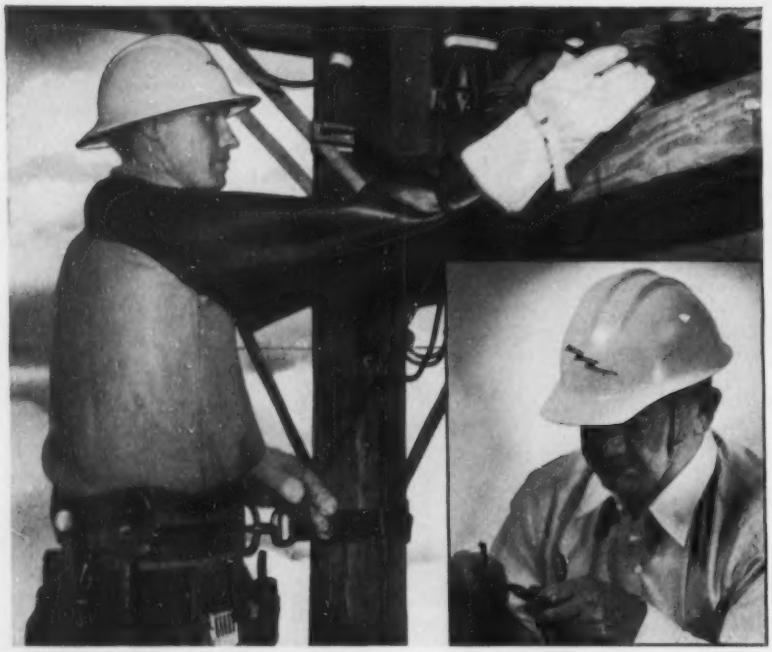
Supplying these service points for the working equipment is a 440 volt secondary system. To make it dependable as well as convenient, the contractor chose aluminum cable insulated with BAKELITE Polyethylene. This combination means extremely light weight—it's a big factor in cutting installation and handling costs. The polyethylene stands up to rough treatment, keeping conductors safe. Its excellent insulating properties protect personnel in contact with the cable. Because of the possibility of flooding and long periods of submersion, polyethylene is used to prevent power breakdowns. Polyethylene will keep moisture out while withstanding abrasion by flood materials.

You'll find BAKELITE Polyethylene has stamina to spare. Ask your cable supplier for complete details on wire and cable covered with BAKELITE Polyethylene, or write Dept. YB-63 for a list of representative suppliers.

Data courtesy **Donovan Construction Co.**, St. Paul 4, Minn., and **Aluminum Company of America**, Pittsburgh 19, Pa.

BAKELITE
TRADE-MARK
Polyethylene

BAKELITE COMPANY, *A Division of Union Carbide and Carbon Corporation* UCC 30 East 42nd Street, New York 17, N. Y.



TESTS PROVE* Bullard 10KV safety hats and caps give complete head protection both from head blows from falling wrenches, insulators, "rake-sticks" and from contact with "hot" lines. Every Bullard hat and cap is tested before it leaves the factory to 10,000 volts . . . and every hat and cap passes industrial and federal 40 ft. pound resistance tests. No holes or rivets that might eventually cause leakage pass through crown or brim. Permanent colors available at no added cost. Universal headsize.

ELECTRICAL INDUSTRIES SLASH ACCIDENT COSTS!

BULLARD BURNHAM SAFETY HOOKS

Anti-friction bearing
Locking pin
Locking groove
Non-corrosive brass safety gate

Usable with every type of equipment (chain hoists, horizontal tuggers, come-a-longs, cranes, block and tackle, and snatch blocks). The B-B safety hook provides complete PROTECTION where accidents begin.

Since 1878
E. D. BULLARD COMPANY
275 EIGHTH STREET • SAN FRANCISCO, CALIFORNIA
Distributors in principal cities around the world

Electrical industries, nation-wide, are discovering accident liability costs and valuable man hours can be sharply reduced by equipping employees with Bullard safety equipment specially designed to combat electrical hazards.

WINTER LINERS
Protects head, neck and ears against extreme cold.

EVERYTHING BULLARD IN SAFETY
T. M.'S REG. U. S. PAT. OFF.
TESTED 10,000 VOLTS 10 KV
HARD BOILED

***FREE**—write for Multiphase laboratory report and circular on 10KV hats and caps. Brochure also available on Bullard-Burnham hooks.

SALES ASSIGNMENTS

COMPANY STAFFS

General Cable Corp has named Philip J. Wanzek manager of the Milwaukee branch sales office, succeeding George S. Riker who has been made manager of the Chicago sales office.

General Electric Co has made these appointments: Michael D. Barnett has joined the Carboloy Department in Detroit as sales representative for the Midwestern district. James R. Bossone has been appointed a district representative to handle GE's Construction Materials in the Philadelphia area. William A. Mulcock has been named regional manager of the Air Conditioning Division with headquarters in Chicago. He will be responsible for the division's sales in Region, III, comprising, Wisconsin, Missouri, Minnesota, Iowa, Kansas, and North Dakota, and parts of Illinois, Indiana, Michigan, Nebraska, and South Dakota.

Thomas & Betts Co has announced reassignment of territories for three sales representatives: Joseph Scholl transferred from the Allentown, Pa., area to Baltimore, Md.; Eugene W. McCrane moved from the Albany, N. Y., region to Boston, Mass,; George Manahan shifted from Boston to Albany, N. Y.

Westinghouse Electric Corp's Electronic Tube Division has appointed H. G. Cheney Midwestern regional sales manager. From offices in the Merchandise Mart Bldg. in Chicago, Cheney will direct Midwestern field renewal sales and warehousing operations. Cheney in 1920 joined Westinghouse's Lamp Division at Bloomfield, N. J. Westinghouse's Lamp Division has named Andrew G. Nelsen, Chicago district manager, succeeding G. W. Howson, who was recently made Atlantic regional manager in Philadelphia.

Sylvania Electric Products, Inc, has announced the promotion of John J. Bahnak to district sales supervisor of the Minnesota territory of its Lighting Division. Bahnak, who will operate from the Plymouth Bldg. in Minneapolis, has been a sales representative since joining Sylvania in 1951.

BullDog Electric Products Co, Detroit, has named Robert L. Major district manager of its Pittsburgh sales office to direct sales activities in Pittsburgh and surrounding areas. Major joins BullDog after nearly 20 years experience in the electrical field, including tenures with Ohio Edison Co, Westinghouse Electric Corp, and Owens-Illinois Glass Co.

REPRESENTATIVES

Standard Transformer Co, Warren, O., has appointed Peterson Engineering, 2000 East 7th Place, Tulsa, Okla., as its representative for the State of Oklahoma.

Malleable Iron Fittings Co has appointed Robert P. Smith & Co, Jacksonville, Fla., as agent for central and northeastern Florida and Lee-Smith Co, Miami, Fla., for southern and southeastern part of that state.

G&W Electric Specialty Co of Chicago has appointed J. L. Howarth Co, 2550 Beverly Drive, Birmington, Ala., as its sales representative in this area.

Another "first" from "Outdoor Motor Headquarters"

Outdoor splashproof synchronous motor, rated 2,000 hp, 1,200 rpm. This motor drives a centrifugal compressor in a chemical plant.

The ELLIOTT Outdoor Splashproof SYNCHRONOUS Motor

- Water is removed from the ventilating air by the external water separators before the air enters the motor enclosure.
- Stator coils are vacuum pressure impregnated to withstand the effects of high humidity or moisture.
- The stator is completely immersed in varnish and baked dry after it is completely wound. This provides a rust preventative treatment for the entire inside of the stator as well as additional moisture protection for the stator coils.
- Collector rings are accessible through a removable transparent cover.

R4-11

With the flying start of hundreds of successful installations of the famous Elliott outdoor splashproof (weather protected) induction motor, Elliott now offers a synchronous motor with similar advantages — splashproof economy with complete immunity to hurricane-driven mist, dust, rain, sleet or snow, and extremes of temperature.

Having passed every test in up to three years of service, Elliott synchronous motors of outdoor type, both vertical and horizontal, are now made available in capacities from 150 hp up. Contact your local Elliott field engineer for details, or write Elliott Company, Ridgway Division, Ridgway, Pa.

Elliott FABRI-STEEL MOTORS AND GENERATORS

ELLIOTT Company

YOU WILL FIND

MANY PROFITABLE IDEAS

IN PHILADELPHIA

Dec. 2-3-4-6-7
1954

21st NATIONAL POWER SHOW

NATIONAL EXPOSITION OF POWER AND MECHANICAL ENGINEERING

COMMERCIAL MUSEUM — PHILADELPHIA

Five fact-filled days at the Power Show can save you months of tiresome and expensive research by providing the ideas for your improved plant operation.

Visit the technically staffed booths of the country's leading manufacturers of mechanical, steam, electrical, hydraulic and pneumatic power equipment for the latest word in power technology.

You will learn how to increase production, improve product design and reduce maintenance costs at a minimum expenditure of your valuable time.

PLAN NOW TO ATTEND

Write early for hotel reservations and advance registration

Under the auspices of the ASME

Management: INTERNATIONAL EXPOSITION CO.

480 Lexington Avenue New York 17, N. Y.

Meetings Calendar

(*Continued from page* 108)

SOUTHEASTERN ELECTRIC EXCHANGE
Accounting Section, Roanoke Hotel, Roanoke, Va., Oct. 21-22; General Sales Conference, Roosevelt Hotel, New Orleans, La., Oct. 28-30; Accident Prevention Committee, Heidelberg Hotel, Baton Rouge, La., Nov. 11-12.

NATIONAL ASSOCIATION OF CORROSION ENGINEERS
Symposium on Corrosion of Underground Structures sponsored jointly by NACE's Niagara Frontier Section and University of Buffalo at university's campus, Buffalo, N. Y., Oct. 27-28.

PUBLIC INFORMATION PROGRAM
Annual Workshop Conference, Chase and Park Plaza Hotels, St. Louis, Oct. 27-29; Mid-Atlantic Region, Hotel Statler, Washington, D. C., Nov. 12.

AMERICAN WELDING SOCIETY
National Fall Meeting, Sherman Hotel, Chicago, Nov. 1-5.

***LOUISIANA POLYTECHNIC INSTITUTE**
3rd Annual Instrumentation Conference, School of Engineering, Ruston, La., Nov. 4-5.

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
Annual Meeting, Haddon Hall, Atlantic City, Nov. 8-11.

NATIONAL ASSOCIATION OF RAILROAD AND UTILITIES COMMISSIONERS
Annual Convention, La Salle Hotel, Chicago, Nov. 8-12.

AMERICAN STANDARDS ASSOCIATION
36th Annual Meeting and 5th National Conference on Standards, Hotel Roosevelt, New York, Nov. 15-17.

WISCONSIN UTILITIES ASSOCIATION
Electric-Gas Sales and Engineering Convention, Schroeder Hotel, Milwaukee, Nov. 17-19.

EDISON ELECTRIC INSTITUTE
Industrial Relations Committee in conjunction with North Central Electrical Association, Minneapolis, Minn., Nov. 18-19; Prime Movers Committee, Astor Hotel, New York, Nov. 29-30; Industrial Relations Committee, EEI Headquarters, New York, Dec. 16.

NATIONAL FARM ELECTRIFICATION CONFERENCE
1954 Meeting, Van Curler Hotel, Schenectady, N. Y., Nov. 18-19.

PACIFIC COAST ELECTRICAL ASSOCIATION
Joint Fall Conference of PCEA's Administrative Service Section and Accounting Section of Pacific Coast Gas Association, Sir Francis Drake Hotel, San Francisco, Nov. 18-19.

***NEW JERSEY UTILITIES ASSOCIATION**
Seaview Country Club, Absecon, N. J., Nov. 19.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS
Annual Meeting, Statler Hotel, New York, Nov. 28-Dec. 3.

PUBLIC UTILITIES ADVERTISING ASSOCIATION
Annual Meeting, Region 2, St. Moritz-on-the-Park, New York, Dec. 2-3.

21ST NATIONAL POWER SHOW
Sponsored by American Society of Mechanical Engineers, Commercial Museum, Philadelphia, Dec. 2-7.

INTERSTATE POWER CLUB
Meeting at Hotel Martinique, New York, Dec. 6.

EASTERN JOINT COMPUTER CONFERENCE-EXPOSITION
Sponsored jointly by American Institute of Electrical Engineers, Institute of Radio Engineers, and Association for Computing Machinery; Bellevue-Stratford Hotel, Philadelphia, Dec. 8-10.

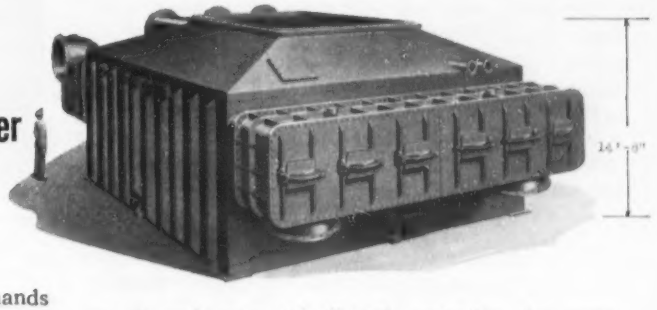
*Additions this week.

More Power TO FLORIDA'S VACATIONLAND

Florida Power and Light Co. will increase capability of CUTLER plant to 375 Mw...

FLORIDA POWER & LIGHT CO. CUTLER PLANT, Design and construction supervision by EBASCO SERVICES, INC.

and 135,000 kw Unit #6 will be served by an I-R 65,000 sq. ft. surface condenser *only 14' 8" high!*



To keep pace with the ever-growing load demands of Miami and its surrounding resort area, Florida Power and Light Company is engaged in a construction program that will bring its total generating capability to over one-million kilowatts by 1956.

The Cutler Plant's capacity will be increased to 375,000 kw when Unit #6, rated at 135,000 kw, goes on the line in 1955.

As illustrated above, the condenser for the sixth unit at Cutler shows what can be done to reduce basement height and still retain the advantages of conventional condenser arrangement. This 65,000 sq. ft. unit only 14' 8" high embodies the same basic design features that have earned Ingersoll-Rand surface condensers their enviable reputation for performance.

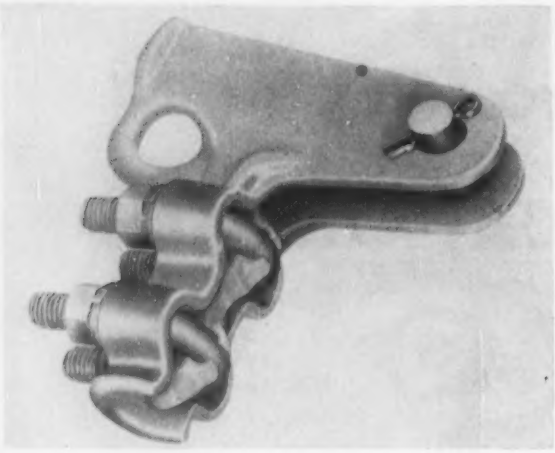
Flexibility in design, as exemplified by this installation, is our forte. Your station layout problems can be met in a similarly efficient, economical manner if you'll call in Ingersoll-Rand surface condenser specialists.

4-71

Ingersoll-Rand
11 Broadway, New York, N. Y.

PUMPS • COMPRESSORS • VACUUM EQUIPMENT • AIR & ELECTRIC TOOLS • GAS & DIESEL ENGINES

NEW EQUIPMENT



Hot-Line Dead End Strain Clamp

Malleable-iron dead end clamp, No. 2050HL, for hot-line work features captured keeper U-bolts fastened directly to the keeper. Cable range is 0.20 to 0.50 in. It is suitable for use on ACSR No. 4 through 1/0. It is also claimed to be suitable for use on copper, copper weld, or Amerductor.

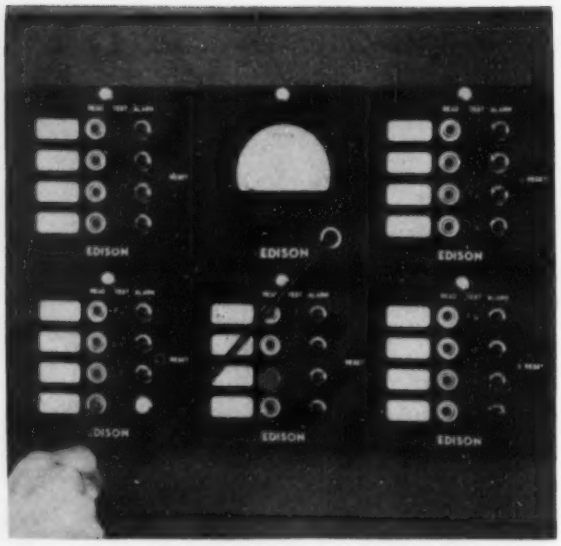
Clamp is said to be ideal for hot-line application, maintenance work, and also to speed installation on original construction. Copper or aluminum liners are available.
Porcelain Products, Inc, Parkersburg, W. Va.

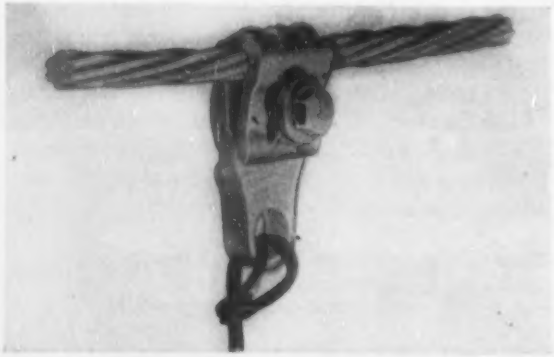
Temperature Monitoring System

Multiple-point temperature monitoring system called Omniguard is designed to protect a few or several hundred remotely scattered points. Its building-block design allows installations monitoring as few as four points. The monitor units and indicator can be mounted close to protected equipment, and alarm may be located in a control room a distance away, greatly reducing wiring costs.

Each point is monitored continuously. Temperature setting of each point is accomplished on the panel. Each monitor unit is completely self-contained. Connections are made by a quick-disconnect plug.

Omniguard uses resistance temperature detectors in a bridge circuit. When the null is reached, a sensitive relay causes a slave relay to lock in, sounding the alarm. To read temperature, a plug from the indicator unit is connected to the appropriate jack in a monitoring unit. A test button is provided for checking operation. Request publication 3036.
Thomas A. Edison, Inc, Instrument Div, West Orange, N. J.





Aluminum-Alloy Mid-Span Clamp

Clamp is designed for attaching Triplex services in mid-span. The MSC-1 clamp is cast in high-strength aluminum alloy and is plated with tin-zinc alloy for all-purpose application. "One-piece" construction eases installation. Interlocking fingers encircle all of the outer strands of the messenger as the clamp is tightened by the bolt.

The bail eye is located close to the messenger to reduce twisting of the messenger with oblique-angle pulls. This compact clamp may be attached to messengers ranging from 4 ACSR to 4/0 ACSR. Line Material Co of Milwaukee, Wisconsin, is the distributor.
Fargo Manufacturing Co, Inc, Poughkeepsie, N. Y.

HUBBARD-COPPERWELD drive-head ground rods

APPROXIMATE PROPORTION OF COPPER AND STEEL IN HUBBARD-COPPERWELD ROD

Those who have tried the Hubbard-Copperweld drive-head type of ground rod are enthusiastic about its convenient built-in clamp. This exclusive Hubbard product simplifies inventory, eliminates confusion, saves time.

The top of the rod is designed to prevent damage in driving, and even if careless driving does batter the end, the clamp is already in place and no problem is created. The Hubbard-Copperweld Drive-Head Ground Rod has the well known features of permanent low cost grounding of the regular Hubbard-Copperweld line, coupled with the added convenience of the integral clamp.

The Hubbard-Copperweld Drive-Head Ground Rod is furnished in $\frac{5}{8}$ and $\frac{3}{4}$-inch diameters and in lengths from 5 to 12-feet. Extra lengths are available on special order.

Write for descriptive literature.

HUBBARD AND COMPANY

ESTABLISHED 1843

PITTSBURGH • CHICAGO • OAKLAND, CALIFORNIA

"Hang the load on Hubbard Hardware!"

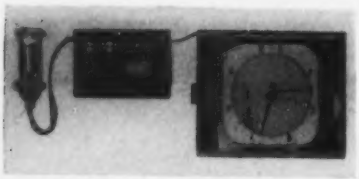
DUXSEAL®
plugs 'em fast-to last!

DUXSEAL is a nonhardening adhesive plastic compound made with an asbestos base. It is the ideal general utility sealing and caulking compound for duct openings, potheads, bushings, terminal boxes, and for filling multi-wire contact boxes indoors. Use it like putty, just as it comes from the handy package, for smooth, workmanlike jobs.

Duxseal stays plastic—will not slump, melt or run under ordinary temperatures. Clings to duct walls and cables but flexes with expansion and contraction. It is unaffected by water and gases, does not react with rubber, metals or painted surfaces. For full information write Johns-Manville, Box 60, New York 16, N. Y. In Canada, 199 Bay St., Toronto 1, Ontario.

JM

Johns-Manville
SEALING COMPOUNDS



pH Instrumentation

Complete systems for pH recording and control incorporates the Beckman Model W amplifier. System includes an Electronic Dynamaster potentiometer recorder or controller, the amplifier, and an electrode assembly of either flow or immersion type, and a variety of final control elements for the addition of gaseous, liquid, solid, or slurried reagents. Bulletin Q1304, 38 pages, gives engineering specifications of each component and installation data.

Bristol Co, Waterbury, Conn.

Control Telemeter

All-tone supervisory control equipment is designed for use with any communication channel capable of carrying audio signals: microwave, vhf radio, carrier, or wire lines.

Manufacturer claims the equipment can be used for controlling and supervising substations and switching stations, opening and closing feeder breakers, selectively switching automatic synchronizing equipment, and adjusting tap-changing-under-load transformers at substations. An indication of tap position or voltage can be telemetered back to the master station. Alarm indications, selective telemetering, and voice communications can be supplied as part of the system. Besides use in generation and transmission of power, the equipment can find use in hydro stations.

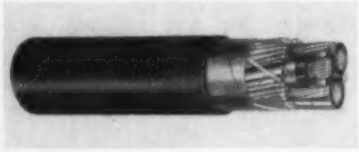
The system uses specific audio tones in a coded sequence, thus assuring no false operation from noise pulses. Heart of the system is an electro-mechanical resonant device, the Vibrasender, that generates an extremely stable tone for transmission, and operates a companion device, the Vibrasponder, (a resonant relay) for receiving. Up to 90 individual points can be controlled and/or supervised by using 12 different tones. Building block design permits expansion.

Motorola Communications and Electronics, Inc, 4501 Augusta Blvd, Chicago 51, Ill.

Fire Control

Supervised fire alarm system meets UL approval and also passes tests for Factory Mutual Laboratories listing. The fire station receiving panel is designed so that all fire detection and associated wiring is supervised against shorts, breaks, and power failure. Sprinkler supervisory equipment can be tied in to the system.

Notifier Manufacturing Co, 239 S. 11th St, Lincoln 8, Nebr.



5,000-V Cable

Non-metallic sheathed cable for 5,000-v power feeder service is made with polyethylene insulating compound, and a polyvinyl-chloride sheath. These materials are claimed to provide superior resistance to chemicals, moisture, and to mechanical damage and wear.

Cable has three conductors, each individually shielded. Ground wires, having a total cross section of at least 90% of one conductor, are in contact with the shielding. The cable is in sizes from 6 AWG to 250 MCM. The 6 AWG cable, rated 72 amp, is 1.22 in. in diam, and weighs 895 lb per 1000 ft. The 250 MCM cable is 2.21 in. in diam, is rated 271 amp, and weighs 4535 lb per 1,000 ft.

Rome Cable Corp, Rome, N. Y.

Plastic Pipe

Corrosion-resistant, rigid plastic pipe with high impact resistance and toughness is a general-purpose material for handling most common corrosives. Called Dur-Ace, it is said to be light in weight, odorless, tasteless, non-contaminating, and resists inorganic acids and alkalis with the exception of a few strong acids. It has limited resistance to organic solvents.

Dur-Ace is claimed to maintain strength, rigidity, and chemical resistance from −40 to 170 F. The pipe is supplied from ½ to 2 in., in standard 20-ft lengths. Wall thicknesses are

in all Fargo "Automatics" you get this "One-Piece" Jaw

And Here's Why:

Precision machining of the "one-piece" jaw from solid bar stock assures *permanent alignment* of jaw segments, which prevents individual strands of the conductor from getting out of place.

Because of "one-piece" construction, jaw segments flair out slightly as the wire is inserted to give an excellent initial grip on the wire.

The entire jaw assembly and conductor move forward as a unit when tension is applied to complete the grip—so it can't let go!

The "one-piece" jaw permits a liberal safety zone to be machined into the back of the jaw to accommodate burred ends of the conductor.

The "one-piece" jaw is made of durable "Duronze," with sharply machined teeth that give a strong, corrosion-resisting bite on the conductor.

. . .for aluminum too!

Ask your Line Material Field Engineer for complete details.

FARGO

Manufactured by

FARGO MFG. COMPANY, INC.

Poughkeepsie, N.Y.

Distributed by

LINE MATERIAL COMPANY

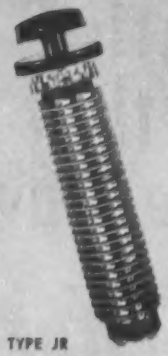
(A McGraw Electric Company Division)

Milwaukee, Wisconsin

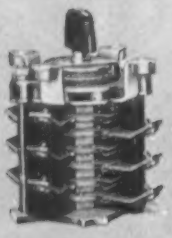
LM

ROTARY SWITCHES

For every control, tap, and transfer application.



TYPE JR



TYPE P, 30A

TYPE A

TANDEM TYPE P, 30-10A

TYPE HT

- Save valuable panel space
- Simplify control of complex circuits
- Give "dead-front" mounting safety
- Listed by Underwriters Labs, Inc.
- Can be furnished to latest Navy specs.
- Ratings from 2 amperes to 200 amperes, 30 to 250 volts d. c., and 125 to 500 volts a. c. — depending on number of circuits and nature of load.

Write for combined catalog giving useful design data on Esco rotary switches.

ELECTRO SWITCH
CORPORATION
167 King Avenue, Weymouth 88, Mass.

Extra Heavy Duty (IPS Schedule 80), and Standard (IPS Schedule 40). Fittings, flanges, nipples, etc, are also available of Dur-Ace, with standard IPS threads.

Working pressure for the extra-heavy-wall pipe at 70 F is 300 psi (for ½ in.) to 150 psi (for 2-in.). For standard wall, pressures range from 150 psi (½ in.) to 75 psi (2-in.). These working pressures are based on a safety factor of 5 to 1.

American Hard Rubber Co, 93 Worth St, New York 13, N. Y.

Gear-Driven Trencher

Claimed to be first gear-driven trencher with gears running in oil, the Jeep-A-Trench Gear-Draulic weighs about 1,750 lb. Unit is well forward in Jeep body over frame for better center of gravity. The welded box section frame serves as a completely enclosed dust-proof housing for the major units.

Hydraulic drive provides an infinitely variable forward speed, and cushions the shocks of changing soil conditions. The boom is raised and lowered hydraulically to any position in the 190 deg arc of travel. Four levers control operations.

The Gear-Draulic will handle trench widths from 6 to 14 in. and any depth down to 6 ft. Depending on soil conditions, speed up to 800 ft per hr is obtainable.

Auburn Machine Works, Auburn, Nebr.

100-Amp Cutouts

Series C cutouts have continuous current ratings of 100 amp. and interrupting capacities up to 10,000 amp. They are available in 5.2, 7.8, 15, and

18 kv maximum design voltage ratings.

The cutouts meet latest NEMA heavy duty standards. Interchangeable fuse holders, with or without load break provisions, are available for heavy and extra heavy duty service. The load break fuse holders permit easy and positive interruption of load current. Switch blades for 200 amp are also made.

This series has all non-ferrous parts, bird-proof construction, color coding of tubes, and double venting on extra heavy duty units.

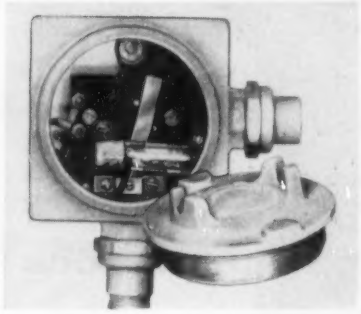
R&IE Equipment Div, I-T-E Circuit Breaker Co, Greensburg, Pa.

3-Ph Coffee Urn Heater

A three-phase coffee urn heater unit, Chromalox Type TTUH, supplements present single-phase units, and is designed to simplify wiring at installations where 3-phase is available: new or modernized restaurants, hotels, clubs, or diners, or other places with "adequate wiring."

Unit is for urns from 1 to 20 gal, and for steam tables or other containers with a minimum water depth of 2½ in. An accessory switch permits heating at ¼, ½, or full power. Thermostat for precise temperatures can also be provided. Capacities range from 1,000 to 6,000 w, at 120, 208, or 240 v.

Edwin L. Wiegand Co, 7513 Thomas Blvd, Pittsburgh 8, Pa.



Safety Switch

The Dual-Safety Switch for cooling tower fans is a combined vibration cut-off and safety switch. Turning the switch off assures safety for personnel working in the fan stacks.

(*Continued on page* 208)

if you want

- **POSITIVE PROTECTION**
- **FAST ACTION**
- **ONE COMPACT UNIT**
- **PLUS REAL ECONOMY**

then specify

JOSLYN ARRESTER CUTOUT COMBINATIONS

RATINGS

7.8 KV 100 AMP. and 150 AMP.
15 KV 100 AMP. and 150 AMP.

JOSLYN

Executive Offices
20 N. Wacker Drive
Chicago

One
This one

company

One company launched the aluminum industry.

One company has 66 years of aluminum research and production experience.

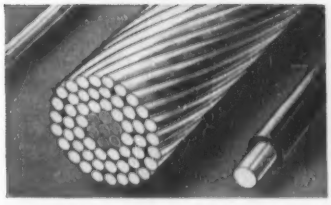
One company has 56 years of technical and field experience with aluminum conductors.

One company maintains the outstanding research, development, testing and production facilities in aluminum conductors.

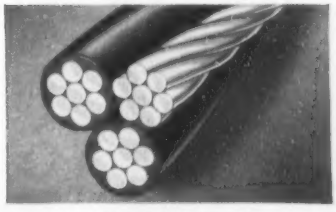
One company has developed and improved aluminum conductor alloys and aluminum conductor designs.

One company manufactures and stands behind a dependable line of both aluminum electrical conductors and accessories.

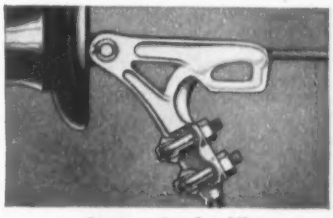
One company maintains a complete headquarters and field engineering staff to assist those who transmit and distribute electric energy.



ACSR and All-aluminum Wire and Cable



Covered Wire and Service Drop

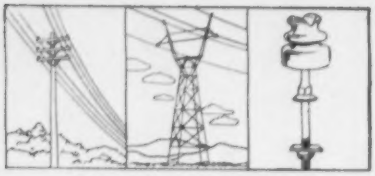


Accessories for All Conductors

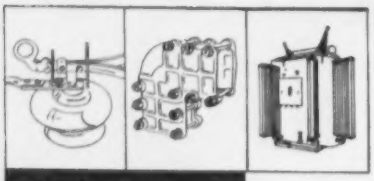
company is ALCOA

ALCOA ALUMINUM

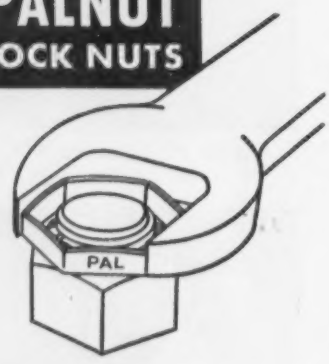
ALUMINUM COMPANY OF AMERICA



Keep Nuts Tight
on all bolted assemblies



Apply low-cost
PALNUT
LOCK NUTS



PALNUT Lock Nuts cost so little, apply so fast, lock so dependably . . . you can specify them for every nut-and-bolt assembly, at negligible cost. Maintenance is reduced on mechanical assemblies—full conductivity assured on electrical connections.

PALNUT Lock Nuts may be used on new or existing equipment. Easily removed and re-used when servicing. Require only 3 bolt threads. Available in Parkerized and hot dip galvanized steel; also silicon bronze.

Send for free samples and Bulletin #577

THE PALNUT COMPANY
51 Cordier St.,
Irvington 11, N. J.

PALNUT
TRADE MARK
LOCK NUTS
for quick, secure fastening at low cost

New Equipment

(*Continued from page* 205)

When a fan looses equilibrium and sets up vibration, a sensitive mercury switch automatically stops the current to the fan. Sensitivity is easily set by a manual adjustment.

Fan can be restarted only by manually resetting the switch. The device is intended for mounting on the gear supporting beam of each fan.

Santa Fe Tank & Tower Co, Inc, 5401 S. Boyle Ave, Los Angeles 58, Calif.

Mobile Generators For 350 to 1,000 Kw

Mobile power generating equipment for emergency service and use in fringe areas is rated 350, 500, 750, or 1,000 kw at 0.8 pf. The units may be mounted on railroad cars. The 350 and 500-kw units can be supplied mounted on semi-trailers. All components are designed and built by one manufacturer as an integrated unit.

All units are designed for automatic operation. Units will start, synchronize, and come on the line at any signal, such as failure of a preferred power source, reduced voltage or frequency condition, or at predetermined load conditions.

Generators are designed for 60 cps, 3-phase operation at either 2,400 or 4,160 v. The 1,000-kw unit is also available for 12,400 or 13,800 v. The 16-cylinder, 2-cycle diesel unit operating at 1,200 or more brake hp will have specific fuel consumption of 0.4 lb per bhp-hr. Literature is available.

Electro-Motive Div, General Motors, LaGrange, Ill.

Cable Laying Machine

Underground cable laying machine, Model B, will cut 36-in. deep and lay cable up to 1½ in. in diam, and requires 20,000 to 30,000 lb drawbar power (illustrated).

Standard equipped Model C machine will cut 42-in. deep and lay wire and cable up to 2⅜ in. in diam, and requires 25,000 to 35,000 lb drawbar power. These machines are designed for strength without unnecessary weight. Cutting blades are high carbon steel with sharp cutting edges and teeth designed to remain in the ground at the required depth. Cable tube opening has guide wheels with sealed ball bearings. Small reels may be mounted on the machine; for large reels a cable reel trailer may be used.

F. B. Ryan, Chariton, Iowa

Fuel Control

Model 405 Capacitrol is designed for control of continuous fuel fired process applications which require a proportional relationship between fuel input and a continuously measured temperature.

The 405 incorporates a modified bridge-type control circuit. A polarized relay in the feedback circuit actuates the fuel valve power unit. Thermocouple break protection is included. Both the temperature measuring system and control chassis are of plug-in design.

Wheelco Instruments Div, Barber-Colman Co, Rockford, Ill.

Boiler Feed Pre-Heater

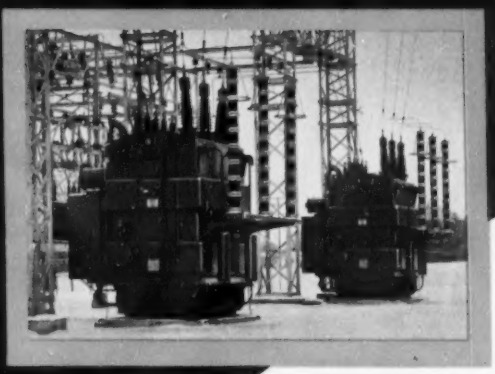
Boiler feed system incorporates a pre-heater unit operating on steam from the boiler. Boiler feed water is automatically maintained between 190 and 200 F. Tank sizes range from 30 to 540 gal. Units will supply from 280 to 2,800 gal of pre-heated water every hour.

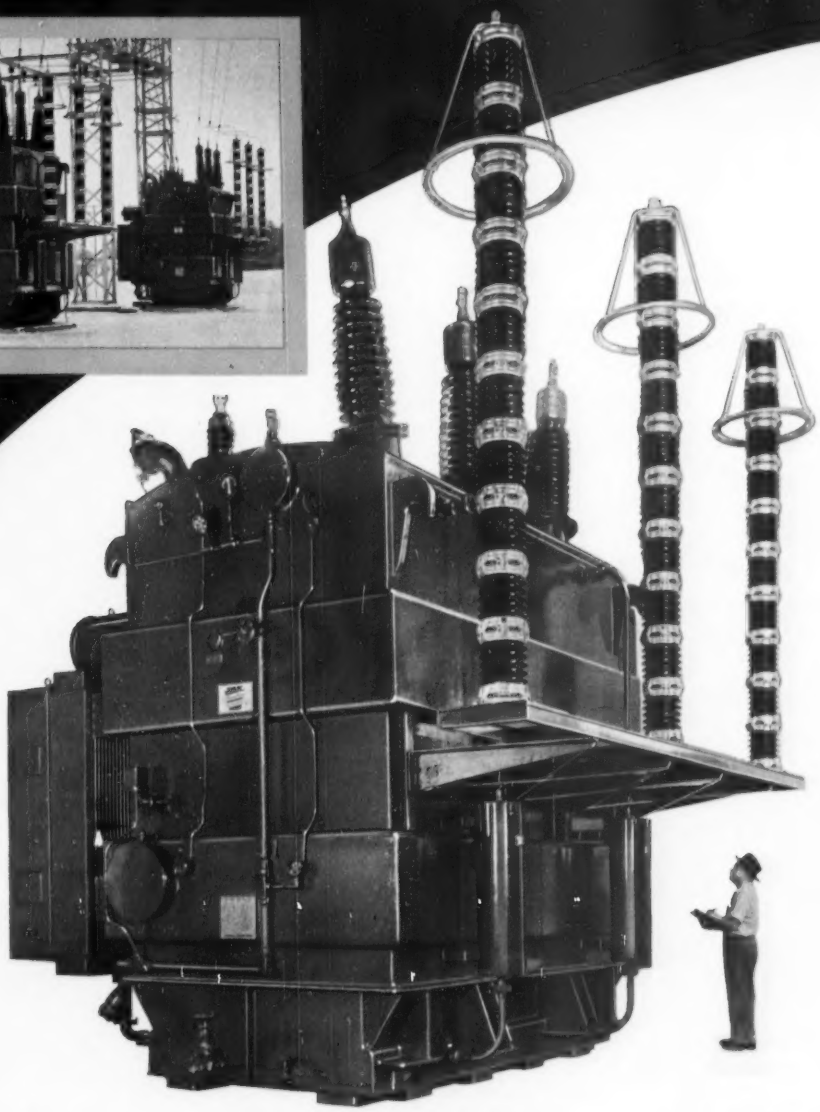
The feed water tank has a perforated tube inserted horizontally and connected to the steam supply. Thermostatic control allows steam to enter only when temperature falls below a predetermined point. A thermostatic bulb filled with pressure-sensitive fluid controls a flexible bellows that opens and closes the valve.

Cyclotherm Division, U. S. Radiator Corp, Oswego, N. Y.

(*Continued on page* 211)

PENNSYLVANIA 40,000 kva *three phase* CONTOUR DESIGN LOAD RATIO CONTROL TRANSFORMER





see next page for inside story

Two identical 40,000 Kva Pennsylvania Load Ratio Control Transformers traveled by train *and truck* in an upright position to their substation. The transformers were completely assembled except for forced cooling equipment and bushings. Installation was therefore relatively fast and easy, and much of the credit for that goes to Pennsylvania's space-saving, shell-form Contour Design. 32-step tap-changing underload equipment maintains a constant low voltage, with the high voltage varying from 100% to 80% of normal voltage. The transformer has a high voltage rating of 132,000 volts; a low voltage rating of 36,000 volts; and a 13,650 tertiary voltage at 14,000 Kva.

PENNSYLVANIA TRANSFORMER COMPANY

A McGraw Electric Company Division • **CANONSBURG, PA.** • *Greater Pittsburgh District*

Inside a **40,000 Kva** *three phase*
PENNSYLVANIA contour design
LOAD RATIO CONTROL TRANSFORMER

40,000 Kva, Three Phase, 60 Cycles, 55°C. Temperature Rise. Forced-oil with forced-air heat exchangers. High voltage: 132,000 Grd.Y. Low voltage: 36,000 Y. Tertiary voltage: 13,650Δ (14,000 Kva). Low voltage windings provided with tap-changing underload equipment for plus and minus 10% regulation in 32-⅝% steps.

Opening for load ratio control mechanism.

Upper Contour Design tank section fits over coil and core assembly and is welded to the bottom tank section.

Compartment for Preventive Auto Transformer.

Vertical cooling ducts in the coils permit a free flow of oil through the coils for most efficient cooling.

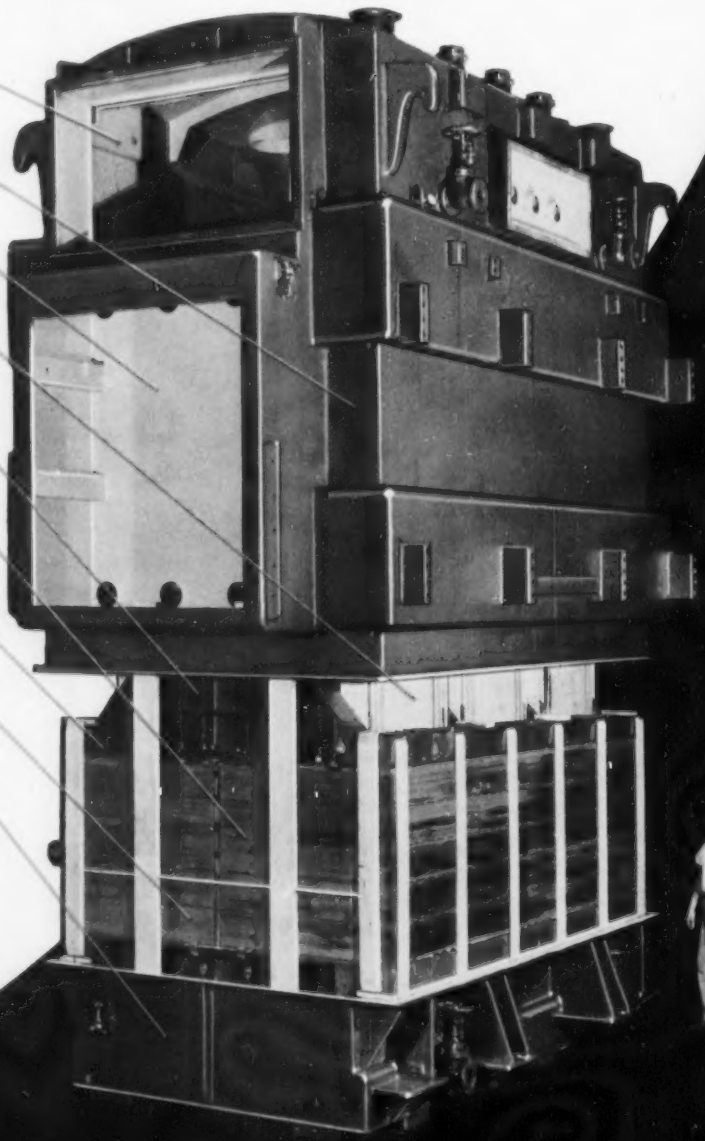
Core and coils clamped together with heavy steel frames to form a rigid structure.

Core and coil unit can be handled separately as a complete sub-assembly.

Heavy box sections form part of core frame and clamp coils against mechanical forces during short circuits.

Core cooled by both vertical and horizontal ducts.

Core and coil assembly rests on bottom section of the Contour Design tank.



for exterior view of this transformer

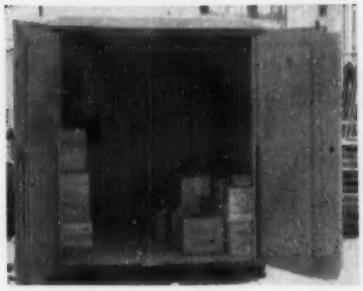
see other side

PENNSYLVANIA TRANSFORMER COMPANY

A McGraw Electric Company Division • **CANONSBURG, PA.** • *Greater Pittsburgh District*

New Equipment

(*Continued from page* 208)



Safe Storage

Portable, welded steel container provides safe storage of explosives, blasting caps, and other construction materials and equipment. The 275-cu ft capacity Transportainer is weatherproof and serves as a storage facility on job sites as well as a shipping container. Outside dimensions are 7 ft 9 in. x 6 ft 5 in. x 6 ft 10 in. Weight is 1,700 lb.

Dravo Corporation, Neville Island, Pittsburgh 25, Pa.

Correction, Please

Telsta Corp, 120 N. Murphy, Sunnyvale, Calif., is the correct address for the manufacturer of the Mobile Electric Lift (EW, Sept. 6, page 154)

Load Bank

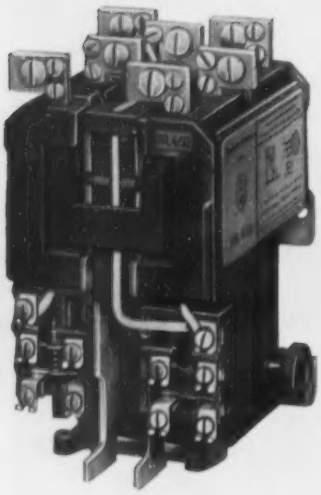
Load bank units for testing generators are rated to 120 kva, dc to 400 cps. Banks are normally calibrated to plus or minus 10%. Exhaust fans are provided where necessary for efficient operation. The units are available in portable, semi-portable, and stationary form; with lagging, unity, or leading pf, and for local or remote control operation. (Bulletin 6010, 4 pages)

Mullenbach Electrical Mfg Co, 2300 East 27th St, Los Angeles 58, Calif.

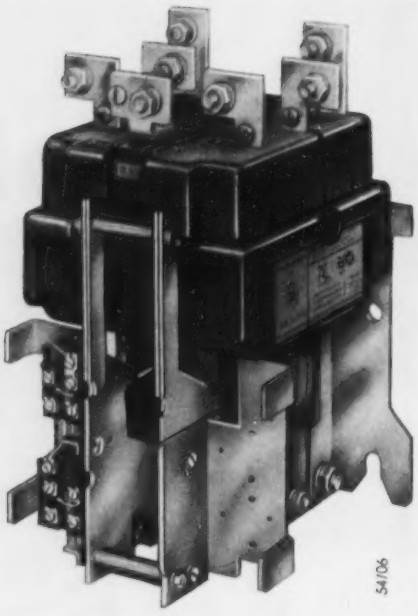
Platform Lift Truck

Model 19-6 Lift-A-Loft may be mounted on a flatbed truck. Minimum height is 7 ft 3 in. above truck bed. It is battery powered for a day's use on or off truck; carries 80 gal

GrateLite*
LOUVER—DIFFUSER
COMES CLEAN QUICK
a two-minute operation
1. AN EASY ONE MAN JOB
2. JUST DUNK IN DETERGENT-WATER MIX
3. SWISH IT AROUND
4. SET IT UP TO DRY—THAT'S ALL
GrateLite regains its brand-new lustre every time—is automatically de-staticized by the detergent—and stays clean longer: bugs and dust drop through the openings—can't collect.
PLUS
High efficiency
Low brightness
Fine diffusion
Excellent shielding
Noise reduction
Air-conditioning diffusion
. . . the secret's in the sight-saving cubes and only GrateLite has them!
Write for free booklet "The GrateLite Story" today.
*U. S. & Can. Pats. Pend. Trademark Registered
Guth
THE EDWIN F. GUTH CO. • ST. LOUIS 3, MO.
Leaders in Lighting since 1902



Contactor life
red contactor DIL 4/52
motor rating 15 HP, 380-500 volts
10 million operations
Motor rating 30 HP, 380-500 volts
3 million operations
green contactor DIL 4a/52
motor rating 40 HP, 380-500 volts
0.5 million operations
This long contact life is achieved by new construction principles.



Contactor life
red contactor DIL 5/54
motor rating 30 HP, 380-500 volts
10 million operations
motor rating 65 HP, 380-500 volts
3 million operations
green contactor DIL 6a/54
motor rating 100 HP, 380-500 volts
0.5 million operations

This long contact life is achieved by new construction principles.

For the first time in the history of the low tension contactor, the principles of the pivot magnet, the toggle joint and four breaks per phase with successively closing contacts have been combined.
The success of this new design is proved by the above figures of the contact life of our contactor type DIL 4 and DIL 5. This life is many times that of the usual contactor type, and has been achieved without impairing any of the other qualities.
The contact path of our new contactors has been designed so that, during the whole of the life of the contacts, the making and breaking process of squirrel cage motors is fully controlled. The most important advantages offered to the users of our new contactor types DIL 4 and DIL 5 are, apart from the high reliability, that they need no contact replacement, maintenance and storage of spare parts.
Large quantities of our new contactors in all branches of industry are proving the great advantages of their long contact life under the most arduous conditions. By saving the user running expenses this equipment contributes considerably to economic production.

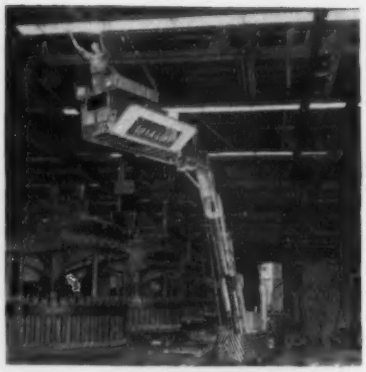
KLÖCKNER-MOELLER·BONN

ELECTRICAL SWITCHGEAR · ENCASED CONTROLS · DISTRIBUTION PANELS

Represented in the United States by:

AMERICAN KLOECKNER-MOELLER-CORPORATION

4113 East 11th Street, Tulsa 12, Oklahoma, Tel. 6-3048



of water for washing lights, etc; reaches over, around, or under barriers; and has controls on platform to operate all movement. Platform capacity is 500 lb, net weight is 6,900 lb. Platform will rise to 19 ft 6 in. above truck bed in 30 sec.

The Model 19-6 may also be used in factories and is self-propelled at 2½ mph. Full specifications available on request.

Mitchell Maintenance Co, Inc, P. O. Box 1225, Muncie, Ind.

MORE NEW PRODUCTS
about which you should know

Protectoseal Co, 1920 So. Western Ave, Chicago 8, Ill., has 380-lb 43 x 65 x 18-in. cabinet for **flammable-liquids storage.** Capacity is 45 gals.

General Electric Co, Silicone Products Dept, Waterford, N. Y., has **silicone resin** (SR-111) for formulating heat- and weather-resistant coatings for smokestacks, ovens, incinerators, etc.

Mathias Klein & Sons, 7200 McCormick Rd, Chicago 45, Ill., has 1901 MG leather clip-on **gaff guard** to protect the spur and other tools in the lineman's kit.

Allis-Chalmers Manufacturing Co, Milwaukee 1, Wis., is using newly-developed **tap changers** for de-energized operation as standard equipment on large transformers. Contacts have rounded surfaces under equal pressure.

Insl-X Sales Co, 26 Rittenhouse Sq, Ardmore, Pa. has E-33 **dipping compound** for insulating tools. Dielectric strength is 1,200-1,500 v/mil . . .

Only 60 Seconds

To open a 24" gate valve

...instead of 12 to 15 minutes

with **Limitorque**

Think of the saving in man hours that could be effected in a year's time by the use of LimiTorque—not to mention the elimination of key men climbing to out-of-the-way, often times hazardous locations of important valves . . . Then too, when LimiTorque opens or closes valves, by the "*mere push of a button,*" the valves are operated at just the correct speed . . . and if an obstruction is encountered in closing, LimiTorque shuts off the motor, thereby preventing any possible damage to the valve seats, stems, discs or gates.
LimiTorque is operating thousands of valves throughout the World . . . day and night, on land and sea, in hot and sub-zero climates, indoors and outdoors . . . *Speedily—Safely—*and *Dependably*. LimiTorque Motor Operated Valves are readily adapted to Microwave Control.

Send for catalog L-54—and remember, *far more valves are operated by* LimiTorque than any other valve control.

Philadelphia Gear Works, INC.

ERIE AVE. AND G ST., PHILADELPHIA 34, PA.
NEW YORK • PITTSBURGH • CHICAGO • HOUSTON • LYNCHBURG, VA.

Industrial Gears and Speed Reducers
LimiTorque Valve Controls

ROAD SIGNS

- SIGN SWAYS WITH THE WIND
- HOT DIP GALVANIZED FRAME
- EQUIPPED WITH 2 FLAG SOCKETS
- COMMANDS ATTENTION
- FOLDS COMPACTLY
- ALL STEEL CONSTRUCTION
- DOUBLE FACE 18" SIGN
- 5 INCH BLACK LETTERS
- STANDS 30 IN. HIGH
- WEIGHT 23 LBS.
- 20" x 24" SIGNS "MEN AND EQUIPMENT WORKING" CAN BE FURNISHED

CAT. NO. 777

DESIGNED FOR UTILITY CO. USE

CAT. NO. 780

BARRICADE BOARDS

- YELLOW and BLACK
- WIDE 5½" FACE
- STEEL LEGS
- 6' LONG 33" HIGH
- FLAG SOCKETS

DICKE TOOL CO. 1201 WARREN AVENUE DOWNERS GROVE, ILLINOIS

GALVANIZED STRUCTURAL STEEL for SUBSTATIONS TRANSMISSION TOWERS

Peak demand up? **Facilities overtaxed?**

Need new suppliers for $ cost and service comparison? Our 18 years experience in serving the electrical industry would be to your advantage.

We offer consultation, scheduling, detailing, fabrication and erection. We will help you meet your needs — anywhere in the United States.

FLINT STEEL

FLINT STEEL CORPORATION

TULSA • MEMPHIS

Champion Bronze Powder & Paint Co, Inc, 2101 N. Elston Ave, Chicago 14, Ill. has Sprayon **plastic sealer** in 12-oz aerosol can or in bulk, for insulating and waterproofing wiring, high-voltage circuits, etc.

Branson Instruments, Inc, 430 Fairfield Ave, Stamford, Conn., has 2-kw **ultrasonic power generator** (Sonogen 2,000) for cleaning and degreasing of metal, rubber, plastics, glass, ceramics, etc, Frequency is 100,000 cps.

Electromode Corp, Rochester 3, N. Y., has wall-type electric **heating panel** rated 1,100 w, 3753 Btu, 120 240 v, and is 21 x 17 x 2¾ in. . . . Thermador Electrical Mfg Co, Los Angeles 22, Calif. has wall fan **heater** with thermostat and neon indicator.

General Electric Co, Schenectady 5, N. Y., has simplified system for **regulating brightness** of up to 20 40-w rapid-start fluorescent lamps . . . Power Equipment Co, Detroit, Mich., has ac **line-voltage regulators** using self-saturating circuit, magnetic amplifer, and gas-tube reference.

Minneapolis-Honeywell Regulator Co, Wayne & Windrim Ave, Philadelphia 44, Pa., has Giannini **angular position encoder,** combined with strip chart potentiometer, to convert data into forms usable by data processing and computing equipment (Data Sheet 10.21-1, 4 pages).

Tenney Engineering, Inc, 1090 Springfield Rd, Union, N. J., has self-contained table-model **low-temperature test chamber,**—100 to 212 F, uses cascade refrigeration, 1 ft x 1 ft work space, 30 x 57 x 30 in. overall.

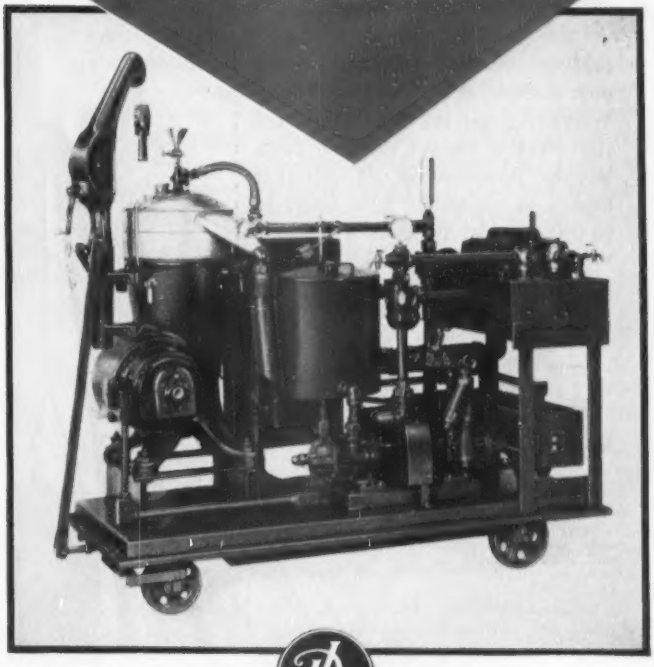
Daybrite Lighting Inc, 5411 Bulwer Ave, St. Louis 7, Mo., has CFI-25 industrial **fluorescent fixture** having 25% uplighting, for 8-ft lamps . . . Thompson Electric Co, 1114 Power Ave, Cleveland 14, Ohio, has Servisafe wall and wood pole brackets for **ground-level luminaire servicing** (Bulletin WHP-54).

Dicke Tool Co, 1201 Warren Ave, Downers Grove, Ill. has 18-in. folding "Men Working" **sign.**

Hewson Co, Inc, 443 Broad St, Newark 2, N. J., has redesigned TAKK **static electricity** control system using new resistance material.

For Positive Maintenance of Insulating Oil Dielectric Strength

THERE'S NOTHING LIKE THIS DE LAVAL PURIFIER



Many large power companies from coast to coast use *De Laval* Purifiers to maintain their transformer and circuit breaker oil in top condition.

There are important reasons why . . .

- De Laval Insulating Oil Purifiers give *positive* protection*. They dry the oil —*really* dry it—*with a single pass* . . .
- They guard against recontamination by removed water—against carbonizing by excess heat—and against sudden loss of dielectric strength during purification . . .
- They give *maximum* protection at *minimum* cost.

The De Laval Insulating Oil Purifier Bulletin (TR-1) gives full details, including specifications and operating characteristics. *Write for it.*

***GUARANTEED!**

When operated at rated capacity, each De Laval Insulating Oil Purifier is guaranteed to reduce the water content of new transformer oil at 90° F. from an initial 1/10 of one per cent to 1/1000 of one per cent (35 KV dielectric strength).

THE DE LAVAL SEPARATOR COMPANY
Poughkeepsie, New York ● 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 5

DE LAVAL

GUARANTEED INSULATING OIL PURIFIERS

PULL and POWER

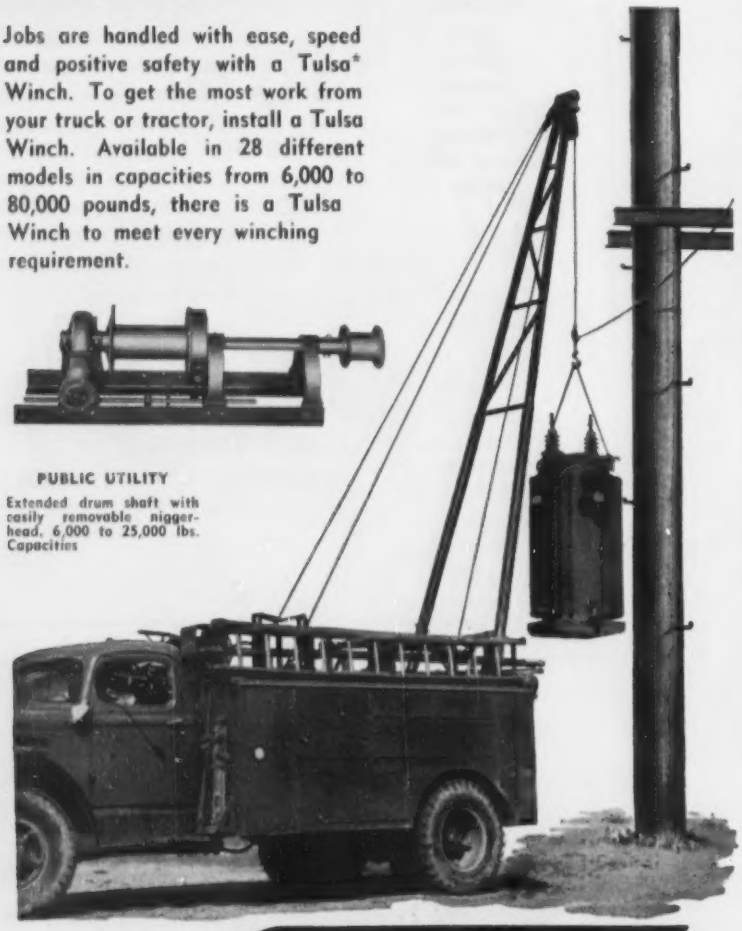
Tulsa Winch models for all trucks from ½-ton up.

Tulsa Winches for all crawler tractors complete with transmission, line roller assembly and mounting brackets ready for installation.

Jobs are handled with ease, speed and positive safety with a Tulsa* Winch. To get the most work from your truck or tractor, install a Tulsa Winch. Available in 28 different models in capacities from 6,000 to 80,000 pounds, there is a Tulsa Winch to meet every winching requirement.

PUBLIC UTILITY

Extended drum shaft with easily removable nigger-head. 6,000 to 25,000 lbs. Capacities



*Reg. U. S. Pat. Off.

Tulsa* Winch
TULSA, OKLAHOMA DIVISION OF VICKERS Inc

CATALOGS • BULLETINS

● **SHOCK MOUNTS:** Bulletin 850 shows use of all-metal shock mounts (4 pages). Robinson Aviation, Inc, Teterboro, N. J.

● **SCAFFOLDING:** Catalog 56 (16 pages) shows use of tubular-steel scaffolding and gives specifications. Beaver Art Metal Corp, Ellwood City, Pa.

● **SHOVELS:** Catalog sheets cover the C-35 ⅝ cu yd crawler shovel and the T-35 ⅝ cu yd 6-ton truck-mounted shovel. Schield Bantam Co, Waverly, Iowa.

● **EARTH BORING:** Form GAA2, 8 pages, catalogs Sterling earth-moving machines. Wyoming Valley Equipment Co, 1089 Wyoming Ave, Forty Fort, Pa.

● **OVENS:** A 12-page catalog (MA-RCS) shows ovens, heaters, air make-up units, spray booths, and washers. Burdett Manufacturing Co, 3433 W. Madison St, Chicago 24, Ill.

● **HEATER CABLE:** An 8-page bulletin shows copper-sheathed, mineral-insulated heater cable units. Nelson Electric Manufacturing Co, Tulsa, Okla.

● **SOIL SAMPLING:** Bulletin 28 (4 pages) shows Models RGT and RG soil sampling rigs. Acker Drill Co, Inc, 725 W. Lackawanna Ave, Scranton 3, Pa.

● **TRENCHER:** Bulletin S-119 (4 pages) shows Model 240 trencher for digging down to 6 ft 3 in. deep. Cleveland Trencher Co, 20110 St. Clair Ave, Cleveland 17, Ohio

● **CHIPPER:** A 12-page booklet, Real Brush Eaters, illustrates use of chippers for disposal of brush and trimmings. Fitchburg Engineering Corp, Fitchburg, Mass.

● **COMPRESSOR:** Catalog sheet shows Model 105 gasoline-powered air compressor rated 100 psig, 105 cfm. Le Roi Company, 1706 S. 68th St, Milwaukee 14, Wis.

● **FILTERS:** Folder F10-54 (4 pages) describes permanent-membrane type liquid filters for oils, soap, solvents, etc. Wagner Brothers, Inc, 400 Midland Ave, Detroit 3, Mich.

● **BOILER WATER:** A 6-page folder discusses the proper "designing" of boiler water. Hall Laboratories, Inc, Hagan Bldg, Pittsburgh 30, Pa.

● **PACKAGED BOILERS:** Have You Checked Your Steam Costs Lately, a 16-page booklet, talks about use of packaged steam boilers. Orr & Sembower, Inc, Morgantown Rd, Reading, Pa.

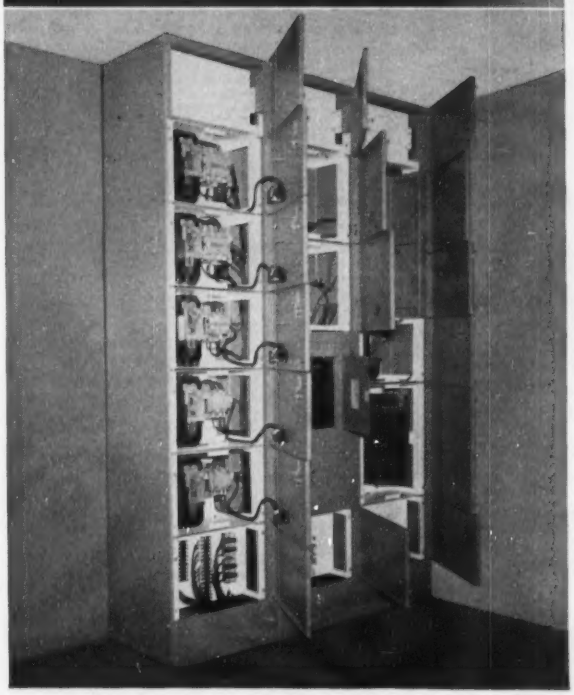
● **GASKETS:** The Gasket (Vol. 1, No. 7, 12 pages) discusses how flange surface finishes affect gasket sealability and joint performance. Test data and recommendations on gaskets and surface finishes are included. Johns-Manville, 22 E. 40 St, New York 16, N. Y.

● **CONDUIT CONNECTOR:** A folder (Bulletin 612) shows Type CT connectors for liquid-tight flexible conduit. Pyle-National Co, 1336 N. Koster Ave, Chicago 51, Ill.

● **GROMMETS:** A 16-page brochure catalogs grommets of proven, synthetic, and silicone rubber. Goshen Rubber Co, Goshen, Ind.

● **NYLON BEARINGS:** An 8-page catalog (Form 206) shows Nylined (DuPont Nylon) bearings for rotation and reciprocation. Thomson Industries, Inc, Manhasset, N. Y.

● **SLOT INSULATION:** Bulletin 750G (2 pages) covers Varslot varnished cam-



The Problem:

RUNNING A BIG PLANT WITH LIMITED PERSONNEL

A CITY FINDS The Answer:

ARROW•HART Control Centers

The City of Meriden, Connecticut was faced with the problem of running its new sewage disposal plant efficiently with limited personnel. An Arrow-Hart Control Center . . . laid out by John P. Legnos, Associates, consulting engineers on the job . . . helped to provide the answer. Magnetic controls for the sewerage and water seal pumps, recording meters that indicate the time the pumps have run, and controls for the unit heaters in the building are all combined in a single, compact A-H Control Center. Both operation and maintenance are handled easily and effectively.

A-H CONTROL CENTERS offer THESE IMPORTANT ADVANTAGES . . .

- **BIGGER SPACE SAVINGS** . . . up to 50% more than any other type, thanks to A-H "Advanced Design" Controls.
- **ADDED FLEXIBILITY** . . . much smaller A-H Controls permit rating increases up to 30 hp without increasing compartment size.
- **GREATER SAFETY** . . . with dead-front construction, all buses and wires completely enclosed; *plus* external handle mechanism that prevents door opening unless the disconnect is in the safe "OFF" position.
- **IMPROVED PERFORMANCE, DEPENDABILITY** . . . are assured by exclusive Arrow-Hart "Right Angle" Starter Design.
- **EASIER MAINTENANCE** . . . all controls are grouped in a single location. Each Control Unit offers Straight-Thru Wiring with all parts easily accessible from the front.

WRITE NOW FOR COMPLETE INFORMATION . . . SEE HOW ARROW-HART CONTROL CENTERS CAN HELP YOU FIND THE SIMPLE ANSWER TO YOUR COMPLEX CONTROL PROBLEMS.

SINCE 1890

ARROW•HART
INDUSTRIAL CONTROL DIVISION
103 HAWTHORN ST., HARTFORD 6, CONN., U.S.A.

Offices, sales engineers and warehouses in: Atlanta, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Dallas, Detroit, Houston, Indianapolis, Los Angeles, Milwaukee, Minneapolis, New York, Philadelphia, Pittsburgh, St. Louis, San Francisco. In Canada: Arrow-Hart & Hegeman (Canada) Ltd., Mt. Dennis, Toronto. In England: Arrow Electric Switches, Ltd., Ealing, London W5.

Quality MOTOR CONTROLS • WIRING DEVICES
ENCLOSED SWITCHES • APPLIANCE SWITCHES

INDUSTRIAL CONTROL DIVISION
THE ARROW-HART & HEGEMAN ELECTRIC CO.
103 HAWTHORN STREET, HARTFORD 6, CONN.

Please send my free copy of Folder CC-44 that includes complete information on Arrow-Hart Control Centers.

NAME _____
POSITION _____
COMPANY _____
COMPANY ADDRESS _____
CITY _____ ZONE _____ STATE _____
EW

Leach CORPORATION
PRESENTS
"The Ultimate in Controls"

Through modern research, engineering, development, design and production techniques, Leach CORPORATION presents electrical control units you will want to investigate . . . *immediately!* Take advantage of the savings they provide and, the *unsurpassed* performance characteristics they incorporate.

INET RX60 Voltage Regulator

Using a completely static system, the RX60 has been designed to provide precise Voltage Regulation for all 60 cycle equipment.

Available in range from 1 KVA to upwards of 5000 KVA, the RX60 can be regulated to ±½%. It is adaptable to any machine with an exciter or will provide its own excitation if necessary.

Having no tubes, contacts or other electronic devices, the RX60 will last indefinitely with a minimum of maintenance.

INET RX400 Voltage Regulator

The RX400 also incorporates all static components and is made to give the same features of long life and low maintenance for 400 cycle applications.

Adaptable to all 400 cycle alternators, the RX400 will regulate voltage to ±½%, no load to full load.

This unit is recommended for use where precise regulation is important, such as Ground Power Supplies, Testing Aircraft Instruments, and in Guided Missile applications.

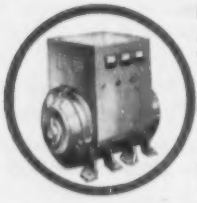
INET DUPY Electro-Mechanical Governor

The DUPY is a load-sensing, electro-mechanical governor used for controlling the speed of a gas or diesel engine. In controlling this speed the DUPY holds D. C. Voltage stable and A. C. Frequency constant under *all load conditions.*

Extremely simple in design, the DUPY can be fitted to any make or model gas or diesel engine by the use of a simple adapter mounting.

Through the use of the DUPY governor, time between engine overhauls can be increased by several hundred percent.

PALMER Series 60 and 400 Alternators



A completely new line of 60 and 400 cycle alternators designed to give exacting frequency output.

Meeting all military and civilian requirements of perfect sine-wave, low harmonic content and precise output, PALMER "Series 60 and 400" alternators are ideal for aircraft, guided missile industries and industrial commercial application.

The "Series 60" may be coupled to any prime mover—gas, diesel, natural gas, etc. The "Series 400" is available as a 2-bearing M-G Set or may be purchased for use with any of the above type engines in 2 or 4 bearing units.

For the "Ultimate in Control" use a Leach CORPORATION "Precise Power Package"... PALMER 60 or 400 cycle alternators, INET RX Voltage Regulators—DUPY Governors. These units are designed to provide exacting regulation and performance.

Write for Bulletins describing these products in detail.

Leach CORPORATION has outfitted a demonstration truck with all of the above operating equipment. Private and public showings are scheduled throughout the country. Write for date the truck will be in your vicinity.

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Development
Design
Production

Leach CORPORATION
5915 Avalon Blvd., Los Angeles 3, California
District Offices and Representatives in Principal Cities of U. S. and Canada

SPECIALISTS IN ELECTRIC & ELECTRO-MECHANICAL CONTROLS

bric-paper combinations for electrical insulation. Insulation Manufacturers Corp, 565 W. Washington Blvd, Chicago 6, Ill.

● **OIL CONDITIONER:** Case Study 6, 4 pages, shows use of oil conditioner for reclaiming transformer oil. Bulletin A-985 (2 pages) shows turbine oil conditioners rated 40 to 900 gph. U. S. Hoffman Machinery Corp, 219 Lamson St, Syracuse 6, N. Y.

● **LIGHTING STANDARDS:** Catalog 300, 24 pages, covers prestressed-concrete lighting standards. Detailed drawings and specifications are included. American Concrete Corp, 5092 N. Kimberly Ave, Chicago 30, Ill.

● **MERCURY LAMP TRANSFORMERS:** Specification MV-208 (Aug. 15, 1954, 4 pages) covers constant-wattage mercury-vapor lamp transformers for outdoor industrial and commercial use. Specification FL-199 (July 1, 1954, 2 pages) covers constant-wattage Sequenstart ballast for rapid-start fluorescent lamps. Sola Electric Co, 4633 W. 16 St, Chicago 50, Ill.

● **FLUORESCENT LIGHTING EQUIPMENT:** User Price Catalog Schedule U-216 (July 26, 1954, 44 pages) covers fluorescent lighting equipment. Smithcraft Lighting Div, Chelsea 50, Mass.

● **LIGHTING EQUIPMENT:** Bulletin E (4 pages) covers Permaflector luminaires and wall urn. Bulletin F (12 pages) covers Permaflector incandescent equipment: interior spots and floods, strip and conduit, and accessories. Pittsburgh Reflector Co, Oliver Bldg, Pittsburgh 22, Pa.

● **LIGHTING:** Eleven new or revised sheets (dated June and July) bring the Day-Brite binder up to date as of Sept. 1. Day-Brite Lighting, Inc, 5411 Bulwer Ave, St. Louis 7, Mo.

● **CO_2 SYSTEMS:** Pressure-operated, carbon-dioxide fire extinguishing systems of the automatic electric type are described in 12-page book. Walter Kidde & Company, Inc, Belleville 9, N. J.

● **EXTINGUISHER:** A 4-page bulletin (RG-154) covers "Redi-Grip" stored-pressure, vaporizing-liquid fire extinguishers, 1 qt to 1 gal sizes. Stop-Fire, Inc, 125 Ashland Pl, Brooklyn 1, N. Y.

● **SAFETY EQUIPMENT:** "Disaster," 12 pages, catalogs safety and rescue equipment (Booklet 5000-4). Mine Safety Appliance Co, 201 N. Braddock Ave, Pittsburgh 8, Pa.

● **SAFETY PRODUCTS:** Catalog 54A, 32 pages, covers safety products for the lineman: gloves, belts, boots, buckets, ropes, etc. Miller Equipment Co, Franklin, Pa.

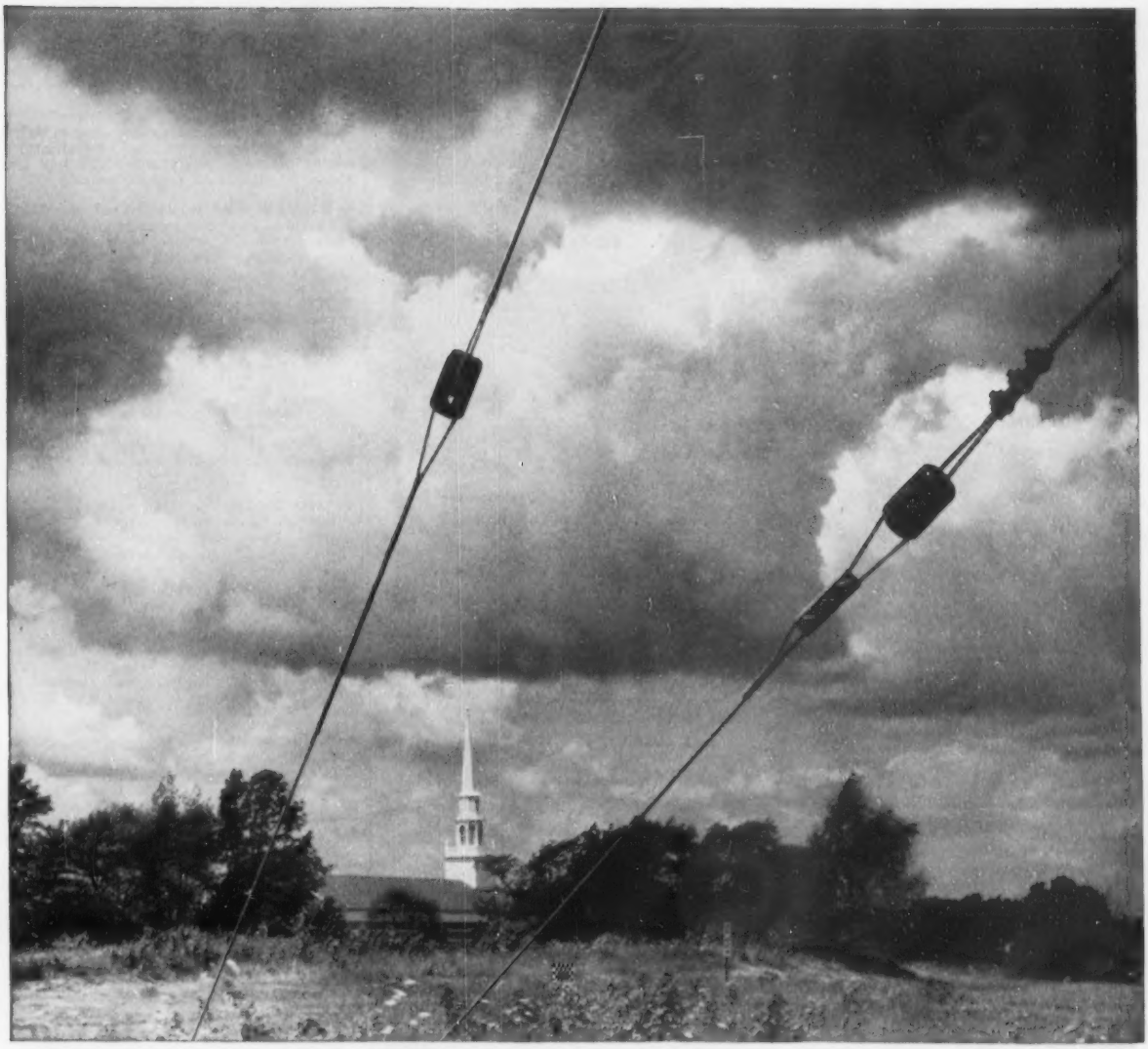
● **WIRING DEVICES:** A 56-page 1954-55 catalog covers approved wiring devices and electrical specialties: plugs, connectors, outlets, extension cords, switches, lamps, receptacles, sockets, etc. Eagle Electric Mfg. Co, Inc, 23-10 Bridge Plaza South, Long Island City 1, N. Y.

● **SERVICE EQUIPMENT:** Catalog SE-1000-1954 (20 pages) covers fusible service equipment, 30 to 6,000 amp. Federal Pacific Electric Co, 50 Paris St, Newark 1, N. J.

● **FUSE REDUCERS:** Bulletin 8 (page) covers fuse reducers. Trico Fuse Mfg. Co, North Fifth at West Chambers, Milwaukee 12, Wis.

● **CONNECTORS:** A 72-page catalog (No. 50) covers connectors, crimp terminals, fabricated tubes, fuse clips, neutral bars, shading coils, stampings, and terminal blocks. Ilsco Copper Tube & Products, Inc, Cincinnati 27, Ohio.

● **CABLE & CONDUIT:** A 24-page catalog covers bushed armored cable, armored leaded cable, bare armored ground wire,



Guy-Grips* BY PREFORMED

...Economical...Neat...Efficient

*at the left

PREFORMED LINE PRODUCTS COMPANY

5349 ST. CLAIR AVENUE • CLEVELAND 3, OHIO

TELEPHONE: CLEVELAND EXpress 1-3571

SUPERIOR
SWITCHBOARD & DEVICES CO.
CANTON, OHIO
A subsidiary of
The Union Metal Manufacturing Company

flexible steel conduit, non-metallic sheathed cable (NM and UF), TW building wire, service entrance cable, and drop cable. Ettco Wire and Cable Corp, 46-50 Metropolitan Ave, Brooklyn 37, N. Y.

● **WIRE LEADS:** A 4-page bulletin covers services for production of custom wire leads: stripping, coding, terminating, solder dipping, etc. Manger Electric Co, Miller St, Stamford, Conn.

● **MINIATURE WIRE AND CABLE:** Miniature and sub-miniature wire and cable rated —90 to 250C is covered in 18-page catalog. Tensolite Insulated Wire Co, Tarrytown, N. Y.

● **WIRES AND CABLES:** Wires and cable for radio, electronics, and TV are covered in 4-page bulletin. Chester Cable Corp, Chester, N. Y.

● **TUBING AND WIRE:** Catalog 54 (44 pages) covers electrical-electronic insulating tubing, wire, cable, and identification markers. Appendix covers definitions and temperature conversion table. William Grand & Co, Inc, North & Valley St, Willimantic, Conn.

● **FIRE HOSE:** An 8-page catalog covers industrial fire hose and fittings, including suction hose and extinguisher tubing (Form 3241-E304). Water hose and water suction hose are covered in an 8-page catalog (Form 3351-E254). Boston Woven Hose & Rubber Co, P. O. Box 1971, Boston 3, Mass.

● **RELAYS:** Data sheets (Circulars 1801 to 1805) cover Classes A, B, F, S, and Z plug-mounted industrial relays. Automatic Electric Sales Corp, 1033 West Van Buren St, Chicago 7, Ill.

● **DC SOLENOIDS:** Bulletin SO-100-300 (4 pages) covers Series 100 and 300 miniature dc solenoids. Joseph Pollak Corp, 81 Freeport St, Boston 22, Mass.

● **ELECTRONIC CATALOG:** Catalog 140 (1955), 304 pages, covers radio, television, sound, and industrial electronics. Allied Radio, 100 N. Western Ave, Chicago 80, Ill.

● **AUDIO EQUIPMENT:** Mini-Catalog covers audio equipment for broadcast stations. General Electric Co, Electronics Park, Syracuse, N. Y.

● **SMALL SWITCHES:** Data Sheet P93 covers Type 11AT toggle switches. Data Sheet P91 covers 13AT subminiature toggle switches. Micro Switch, Freeport, Ill.

● **DIODES:** Bulletin SD-1A (4 pages) covers selenium diodes (16 subminiature types). Bulletin GD-1A (4 pages) and ER-191 (2 pages) cover germanium diodes (30 types). International Rectifier Corp, 1521 E. Grand Ave, El Segundo, Calif.

● **OIL PURIFIERS:** Bulletin 96 (8 pages) shows various uses of purifiers for transformer and engine oils. Hilliard Corp, Elmira, N. Y.

● **LUBRICATION:** The A.B.C. of Modern Lubrication, 4 pages, shows a system of automatic metered lubrication. Bijur Lubricating Corp, Rochelle Park, N. J.

● **RELIEF VALVES & STRAINERS:** Catalog 12-T, 8 pages, shows relief valves and strainers for piping protection, rated to 2,000 psi at 100 F, and 700 psi at 850 F. Edward Valves, Inc, 1201 W. 145 St, East Chicago, Ind.

● **VALVES:** Valves for oil, air, gas, and water; hand, foot, power, and solenoid operated, are covered in Bulletin 1010, 16 pages. Ledeen Manufacturing Co, 1600 So. San Pedro St, Los Angeles 15, Calif.

● **VACUUM METALLIZING:** A 20-page booklet covers vacuum metallizing (Catalog 780). F. J. Stokes Machine Co, 5500 Tabor Rd, Philadelphia 20, Pa.

(*Continued on page* 224)

SAVE up to 85% brush handling costs

This new M&M Brush Grinder rapidly converts 7 truckloads of brush into one truckload of chips.

Save on labor costs . . . truck operating costs. One man feeds brush or branches up to 6" in diameter into the Brush Grinder where they are chewed into small uniform wood chips and automatically blown into a truck or spread on the ground. The new M & M Brush Grinder is a portable unit with its own power plant. It hitches to jeep, car or truck for transportation right to the job. Safe easy operation with all moving parts fully enclosed. Nearly 100 years of experience in building fine grinding equipment is your assurance of long dependable service from an M & M Brush Grinder.

81

WRITE FOR ILLUSTRATED FOLDER TODAY

MITTS & MERRILL 1002 S. WATER ST., SAGINAW, MICHIGAN

Motorists: here's proof...

Gulf's cleaner-burning, super-refined gasoline solves today's No. 1 engine problem!

This lamp is burning the "DIRTY-BURNING TAIL-END" of gasoline which GULF refines out
This lamp is burning NEW SUPER-REFINED GULF NO-NOX, the cleaner-burning super-fuel

Laboratory tests promised...

. . . these *immediate* and *lasting* benefits from this new, super-refined fuel:

More complete engine protection than from the so-called "miracle-additive" gasolines. Why? Because Gulf refines *out* the "dirty-burning tail-end" of gasoline (the No. 1 troublemaker in high-compression engines)—and then treats this new Super-Refined NO-NOX to give it a *complete range of protective properties*. It protects *every* part it touches against carbon, rust, gum.

Extra gas mileage in all your everyday, short-trip, stop-and-go driving.

No knock, no pre-ignition. Why? Because the anti-knock power of new Gulf NO-NOX has been stepped up to an all-time high.

Stall-proof smoothness. Instant *starts*, too—and fast, fuel-saving warm-up.

That's why new Super-Refined Gulf NO-NOX gives your engine more power-with-protection than you've ever known.

Road tests proved...

These cars, powered by New Gulf No-Nox, actually performed better than new . . . after 15,000 miles!

True! After 15,000 miles per car—covering all conditions of city and country driving—Gulf test cars showed these results:

- Higher-than-new horsepower!
- Better-than-new on gasoline mileage!
- And not a single trace of carbon knock or pre-ignition at any time—even on the steepest mountain grades!

COMPLETELY NEW! SUPER-REFINED

New Gulf No-Nox

THE HIGH-EFFICIENCY GASOLINE

GULF

From Kennecott...

121,040,000 reasons why people should do something about their home wiring!

15,130,000 times a month . . . for eight successive months! That's how many appearances ads like the one opposite are making before Saturday Evening Post and This Week audiences!

A total of 121,040,000 hard-hitting salesmen are going out to sell the public on residential re-wiring, on the installation of larger-sized wires, more circuits and outlets — the kind of wiring that boosts appliance sales and increases electrical consumption.

Look at it this way: Surveys show that 80% of the homeowners in your territory need their homes re-wired. The market is waiting and willing. Kennecott's down-to-earth, educational advertising campaign is made to order for it!

This is your cue to jump in with both feet . . . to coordinate your own promotion with Kennecott!

• • •

Send for FREE copies of new consumer booklet, "The ABC of Home Wiring;" free newspaper mat ads, reprints and posters for your own local promotion. Address your letter to Carl Lenz, President, Kennecott Sales Corporation, 161 East 42nd St., New York 17, N. Y.

Why couldn't it do that before?

Don't blame it on the vacuum cleaner! It was doing the best it could on a starvation diet! You see, the wires in this lady's house just *weren't large enough* to carry enough electricity to the vacuum cleaner at the same time they powered her many other electrical needs.

And let's face it, it's 4 to 1 the wiring in your own home is in the same shape! Surveys show that more than 80% of all American homes of today are *underwired!*

Here's what happens!

How can you tell if your wiring is inadequate? In addition to poorly operating appliances, here are some other symptoms of electrical illness:

Fuses blow out; circuit breakers trip too often; lights flicker, or dim, when appliances are turned on; TV pictures are smaller than they should be.

If your house is 10 or more years old, the chances are that its original wiring cannot carry all the current your appliances now need.

New houses suffer, too!

Even if your house is brand new, its wiring may become overloaded if you add a single new appliance! An air conditioner or an electric broiler, for instance.

What should you do? Why, do what the happy lady in the picture above did! Consult your local electrical contractor. His up-to-date wiring methods can make the electrical modernization of your home easier, thriftier than you think!

Here's what to do!

If you own a house see your electrical contractor. He will check your needs, estimate costs.

If you plan to buy a house, it's a smart idea to have the capacity of its wiring *pre-checked.*

If you plan to build, consider the *future.* Average electrical needs increase 10% *yearly!*

Many public utilities offer free adequate wiring service. Call yours!

Free Booklet! "The ABC of Home Wiring." Write now to Kennecott Copper Corporation, Dept. S6, Box 238, New York 46, N. Y.

Published for your information by

Kennecott
COPPER CORPORATION

Fabricating Subsidiaries: CHASE BRASS & COPPER CO., KENNECOTT WIRE &

This advertisement, appearing in SATURDAY EVENING POST and THIS WEEK, will reach more than fifteen million readers. It is only one of a regular series of Kennecott advertisements aimed at educating the public to the importance of adequate home wiring.

Get Automatic
Low Cost Purification
of Insulating Oils
in
TRANSFORMERS, CIRCUIT BREAKERS, SWITCH GEAR AND OTHER OIL FILLED EQUIPMENT

with the
Houdaille
Purivac

the mobile oil purifier that...

1. Performs complete purification, dehydration and degasification in one automatic operation with complete safety!
2. Operates in the field (without taking electrical equipment out of service) or at a central station.
3. Eliminates costly transformer cleaning operations . . . restores color, neutralization number and dielectric strength of oil.
4. Extends useful life of oil . . . reduces power failures and equipment damage.
5. Insures complete protection with automatic interlocking safety controls.

Here are some of the many companies using PURIVAC oil purification to reduce power failures and equipment damage caused by deteriorated oil. Only Houdaille Purivac gives you complete oil purification service.

WRITE TODAY for equipment bulletin and complete specifications.

CENTRAL MAINE POWER CO.
CINCINNATI GAS & ELECTRIC CO.
CITY OF LOS ANGELES
DOBLE ENGINEERING CO.
EASTERN SHORE PUBLIC SERVICE
INDUSTRIAL RAYON
IOWA PUBLIC SERVICE CO.
KANSAS GAS & ELECTRIC
MEMPHIS POWER & LIGHT
MINNKOTA ELECTRIC SERVICE CO.
NATIONAL LEAD COMPANY
NORTHERN STATES POWER
OMAHA PUBLIC SERVICE DISTRICT
PENNSYLVANIA POWER & LIGHT
PHILADELPHIA ELECTRIC CO.
PORTLAND ELECTRIC CO.
PUBLIC SERVICE OF INDIANA
QUEBEC HYDRO-ELECTRIC COMMISSION
WESTINGHOUSE ELECTRIC INTERNATIONAL

HONAN-CRANE CORPORATION
819 WABASH AVENUE • LEBANON, INDIANA
A Subsidiary of
HOUDAILLE-HERSHEY CORPORATION

CATALOGS • BULLETINS

(*Continued from page* 220)

● **CYLINDERS:** A Cylinder Program for Automation and Heavy Duty Service, 12 pages, covers 200 psi air and 2,000 and 2,500 psi hydraulic cylinders. Miller Fluid Power Co, 2040 N. Hawthorne Ave, Melrose Park, Ill.

● **VALVES:** Choosing The Right Valve, 20 pages, gives basic valve designs for specifiers and buyers of piping equipment. Crane Co, 836 S. Michigan Ave, Chicago, Ill.

● **SHAFT COUPLINGS:** A 4-page bulletin (No. 28) covers Kushion-Torq shaft couplings rated ¾ to 1,500 hp for protecting equipment subject to shock load. Brown Engineering Co, 23 N. Third St, Reading, Pa.

● **RUPTURE STRESS:** Technical Data Card 153-A gives stress rupture data on eleven Croloy tubing steels used in high temperature service. Babcock & Wilcox Co, 712 Eleventh St, Beaver Falls, Pa.

● **STAINLESS EXTRUSIONS:** A 4-page bulletin shows hot-extruded shapes being offered in stainless, tool steels, high temperature alloys, and other steels, and describes advantages of extruded shapes. Allegheny Ludlum Steel Corp, 2020 Oliver Bldg, Pittsburgh 22, Pa.

● **MAGNESIUM:** A 4-page folder shows use of Magseal impregnation to increase the corrosion resistance of magnesium castings. Nu-Line Plastic Impregnating, 3457 E 15th St, Los Angeles 23, Calif.

● **FURNACE BELTS:** Bulletin T-241, 6 pages, covers Thermalloy conveyor belts for heat-treating furnaces. Electro-Alloys Div, American Brake Shoe Co, Taylor St and Abbey Rd, Elyria, Ohio

● **METALLIZING:** The 12-page 1954 catalog covers equipment and materials for spraying with metals. Equipment uses metal as wire, compressed air, gas, and oxygen and the metallizing gun. Metallizing Engineering Co, Inc, 1101 Prospect Ave, Westbury, L. I., N. Y.

● **MERCURY CASTING:** Frozen-mercury precision casting for producing complex parts is described in an 8-page booklet. Mercast Corp, 295 Madison Ave, New York 17, N. Y.

● **TAPES:** Permacel pressure-sensitive electrical tapes are covered in Bulletin 110, 20 pages. Acetate cloth, acetate film, flatback and crepe paper, vinyl film, cotton cloth, glass cloth, and Mylar tapes are covered. Insulation Manufacturers Corp, 565 West Washington Blvd., Chicago 6, Illinois.

● **ADHESIVES:** Laminating adhesives for film, foil, fabric, and other web laminates are covered in 12-page Manual 110. Cross-reference charts aid selecting adhesive for different materials. Rubber and Asbestos Corp, 225 Belleville Ave, Bloomfield, N. J.

● **COPPER-CLAD FORMICA:** A 12-page book shows "Formica Copper Clad" for printed circuits and many examples of its use. Formica Co, 4614 Spring Grove Ave, Cincinnati 25, Ohio

● **CATHODIC PROTECTION:** Use of graphite anodes in cathodic-protection systems is shown in Catalog Section S-6500 (12 pages). National Carbon Co, 30 E. 42 St, New York 17, N. Y.

● **ALUMINUM EXTRUSIONS:** Aluminum Extrusions, 34 pages, is a comprehensive study of extrusions and design details, applications, fabrication, finishes, and characteristics. Single copies free on letterhead request; additional copies, $1.50. Harvey Aluminum, 19200 S. Western Ave, Torrance, Calif.

NOW! UNISTRUT® CHANNEL AND FITTINGS APPROVED BY UNDERWRITERS' LABORATORIES as a Surface Metal Raceway!

Long popular as a quick-erected, low-cost method of lighting support, UNISTRUT channel and fittings have now been approved for use as a surface metal raceway...for wiring lighting installations and for supplementary power wiring (up to 600 v.) of machines, motors, other lighting rows, etc.

Faster, Lower Cost Installation—The UNISTRUT system is quick and easy to erect from stock parts. No wire pulling necessary as wires are *laid in* the channel and closer strip snapped in place. Continuous channel support permits wider spacing of hanger stems, reducing installation time and costs. Lines tapped from the channel for supplementary wiring eliminate special lines and extra cost.

Neat Appearance, Complete Flexibility—Straight, strong and rigid, UNISTRUT channel gives lasting true alignment that's undisturbed by changes or servicing. Concealed wiring eliminates unsightly external power lines. Fixtures may be attached anywhere along channel length...ideal for continuous run or spaced fixtures. Attachment of hanger stems at any point on channel permits quick, simple installations in spite of ceiling irregularities.

In this building, UNISTRUT channel was used to support and wire a lighting installation on a concrete ceiling. Savings over conventional methods of installation were estimated at 50%! Note the neat, perfect rows of fixtures.

Lighting for a large manufacturing plant was solved fast by using UNISTRUT channel for support and wiring. Even on ceiling arrangements as this, using two types of fixtures, the UNISTRUT System installs quickly and easily.

UNISTRUT System goes up fast from stock channel and fittings!

Four sizes of channel

Simple, standard fittings

The World's Most Flexible All-Purpose Metal Framing

UNISTRUT

Available now at your UNISTRUT Distributor

See your UNISTRUT Distributor for complete information on the UNISTRUT system of light support and wiring, or ask to have a UNISTRUT Demonstrator car brought to your door. Warehouse stocks in all principal cities. In Canada, Northern Electric Company. For export Pressed Steel Car Co., New York, N. Y. See your telephone directories.

Send for folder.

Write today for free copy of bulletin FF-3 and Underwriters' Laboratories Specifications.

UNISTRUT PRODUCTS COMPANY
1013 W. Washington Blvd. Dept. W-10
Chicago 7, Illinois

Name.....

Company.....

Address.....

City.....*Zone*...*State*.....

Today's ***Positive Answer*** to Industrial–Commercial Lighting Problems!

Rows of Sylvania IC Fixtures provide 50 foot candles in testing department at Sylvania's new Batavia, New York, television plant.

Note clear, high-level office lighting obtained with Sylvania IC Fixtures.

"IC Fixtures so efficient," says Sylvania Engineer, "we chose them for our newest plant."

Engineers responsible for Sylvania's great new plant at Batavia, New York, insisted it be a model of efficient and economical operation in every respect.

When it came to lighting, these men unqualifiedly selected Sylvania's latest IC Fluorescent Fixtures, with a lighting distribution of 60% downward and 40% upward. The extreme versatility of these fixtures plus their ready installation, low maintenance, and durable construction make them ideal for scores of applications. Crosswise shielding of 45° minimizes objectionable brightness.

These award-winning fixtures will give your customers better light, greater satisfaction. For full details drop a line to Dept. 4X-2827, Sylvania, NOW!

Plaque for outstanding industrial fluorescent fixture won by Sylvania at Second National Electrical Industries Show

SYLVANIA

Sylvania Electric Products Inc., 1740 Broadway, New York 19, N. Y.

In Canada: Sylvania Electric (Canada) Ltd., University Tower Building, St. Catherine Street, Montreal, P. Q.

LIGHTING • RADIO • ELECTRONICS • TELEVISION

TECHNICAL LITERATURE

EEI PUBLICATIONS—Following are available from Edison Electric Institute, 420 Lexington Ave, New York, N. Y.:

● 54-5 A-c Network Operations, 1950-1952, Report of The Transmission and Distribution Committee. The report covers 381 networks serving a peak load of 4,366,507 kva. 36 pages, 75¢ to members, $1.90 to non-members in U.S.A., $2.00 foreign.

● 54-6 Turbine Operating and Outage Data for 1952. Report of the Turbines and Condensers Subcommittee of the Prime Movers Committee. The report covers operating and outage data on 367 turbines operating at 800 psi and higher, and of the horizontal type 20,000-kw condensing or 10,000-kw superposed, and larger. 13 pages, 40¢ to members, $1.00 to non-members, $1.10 foreign.

● 54-8 Cable Operation, 1952. Report covers operating experience with paper-insulated cable above 7.5 kv between phases and joints and terminations, as reported by 15 contributors who operated 16,669 mi of cable. Total cable trouble rate for paper duct lay cable decreased from 8.0 in 1951 to 7.5 in 1952; joint trouble rate increased from 2.2 to 2.3; termination trouble rate increased from 0.9 to 1.2. 17 pages; 70¢ to members, $1.75 to non-members, $1.85 foreign.

● MS-9 1954. Specification for Test Switches for Transformer-Rated Meters, Approved by Committee on Metering and Service Methods, Assn of Edison Illuminating Co, and Meter and Service Committee, EEI. This is intended for use by member companies in preparing specifications for purchase of these materials. 6 pages.

● Residential Wiring Handbook, revised edition, has been developed and endorsed by 11 organizations to set forth standards for home wiring systems for architects and engineers, builders, contractors, home buyers, and those modernizing older homes. (EW, Sept. 20, page 110) 32 pages.

● Glossary of Electric Terms,' Financial and Technical, 1954. Prepared by the Statistical Committee, this glossary provides practical definitions of principal reporting terms relating to the electric utility industry. Special attention has been given to brevity—definitions are not recommended for legalistic interpretations. However, they are generally descriptive of predominant and objective practice. 34 pages, no charge.

REA MATERIALS—Bulletin 43-5, List of Materials for use on Systems of REA Electrification Borrowers, and List of Materials Accepted on a Trial Basis, 1954. This 200-page book is available to qualified persons on request. Rural Electrification Administration, Department of Agriculture Bldg, Washington 25, D. C.

EXUDATION FROM WOOD—The Exudation of Oil Type Preservatives from Treated Wood, 4 pages, by P. B. Mayfield, is reprinted from the February issue of the Forest Products Research Society Journal. Barret Div, Allied Chemical & Dye Corp, 40 Rector St, New York 6, N. Y.

SLIDEFILM: UTILITIES IN ACTION, 35 mm, shows the achievements of utilities in encouraging the electrification of industry during 1953. It reports on activities of Philadelphia Electric Co. and Arizona Public Service Co, winners of the 1953 More Power to America Award, awarded annually by GE and presented through EEI. Apparatus offices, or General Electric Co, 1 River Rd, Schenectady 5, N. Y.

IRON CASTINGS GLOSSARY—Glossary of Terms for producers and users of iron castings, 36 pages, explains over 150 technical terms. International Nickel Co, Inc, 67 Wall St, New York 5 ,N. Y.

CARBON BLACK TAPES in ANACONDA Type CB Cable keep deterioration products outside dielectric field . . . lengthen cable life.

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For greatly extended sheath life of ANACONDA Type CB Cable, specify ANACONDA F-3** alloy. This superior alloy-lead sheath won't age-harden . . . resists slow-bending fatigue, creep, burst and abrasion. Cable joint sleeves also are available in this same alloy. They all offer higher tensile strength, a 50% higher bursting strength than copper-lead, lower creep rate and similar increased resistance to bending fatigue and vibration.

For the full story on this superior, time-tested cable, see your Anaconda Representative. *Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.* 60331

*CB — Carbon Black (U. S. Patents 2,102,129, 2,405,853) Reg. U. S. Pat. Off.

**F-3 — Arsenic-Lead Alloy (U. S. Patents 2,300,788, 2,375,755, 2,504,600 and 2,570,501) Reg. U. S. Pat. Off.

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Service and overhead distribution cables, bare and weatherproof, including ACSR • signal, control and communication cable • portable cords and cables • network cables • airport and series lighting cables • mine cables • magnet wire • copper, aluminum and copperweld conductors • wire and cable accessories.

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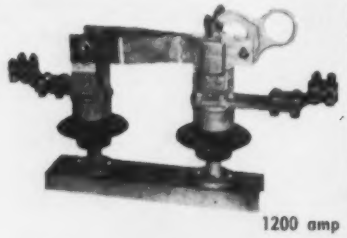
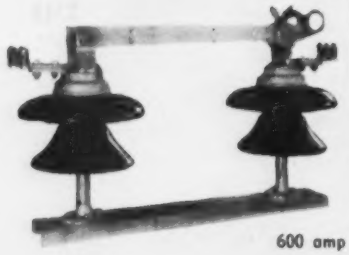
Parts above insulation are all non-ferrous

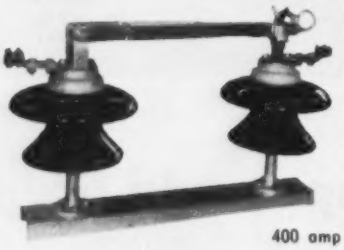
THE completely housed contact affords maximum protection against snow, sleet, and dirt. The positive latch acting on blade adjusts automatically for dimensional variations due to temperature changes, mountings, or insulator deflection. Large area TONGUE TYPE front and hinge contacts are machined and ground to close tolerances. Heavy pull rings with pry-out feature and large eyes are provided. These rings are easily found, even at night, with a hook stick. 90° blade stops are optional. Grind finish contact surfaces provide multiplicity-of-point contact. These surfaces are heavily silvered, with the silver metallurgically bonded to the contact surfaces. Trussed type copper blades insure rigidity.



1200 amp



600 amp



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BOOKS

Service Guide for Television and Radio

Television and Radio Repairing. By John Markus. Published by McGraw-Hill Book Co, New York 36, N. Y. 556 pages, illustrated. Price $7.95.

Practical and simple instructions are presented for television and radio servicing with step-by-step instructions for testing, repairing and replacing all parts. The book is intended to train the complete beginner to fix about 75 percent of the average repair jobs. It includes the checking and replacing of faulty tubes, power supplies, resistors, condensers, coils, tuning devices and speakers; also how to install antennas and use test instruments. It is intended for home study and as a classroom text in vocational schools and high schools.

Keeping Up with the Electrical Code

Electrical Code Diagrams, Volume 2. By B. Z. Segall. Published by McGraw-Hill Book Co, Inc. New York 36, N. Y. 892 pages, illustrated. Price $12.50.

This is the second volume of a two-volume work based on the 1951 Edition of the National Electrical Code. It deals with general use equipment, special occupancies, special equipment, special conditions and communication systems. It shows diagrammatically one or more illustrations for each code rule. Supplementary information clarifies how each rule may be applied. Both practical and theoretical material is given, including motor theory and some basic electronics. It is designed for those in practical electrical work and school and industrial training classes as a means of keeping up with the code.

Reactors for Atomic Research

Nuclear Reactors for Industry and Universities. By E. H. Wakefield. Published by Instruments Publishing Co, Pittsburgh 12, Pa. 93 pages, illustrated. Price $2.00

Eight nuclear experts have contributed a chapter apiece to demonstrate that nuclear reactors can be built so cheaply and safely that many universities and industrial laboratories should acquire them for research purposes. The types and their relative advantages are recorded with advice as to selection. Control and measurements are discussed along with protective measures and costs. The crop of future nuclear engineers will come from schools and laboratories that engage in the research outlined in the book as well as from the Atomic Energy Commission and contractor laboratories.

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ITS EVERY FEATURE is engineered for *YOUR* business... for maximum usefulness . . . for substantial savings in *YOUR* transportation costs. The White 3000 is saving time, cutting costs in progressive companies everywhere. Why not call your White Representative for facts...today?

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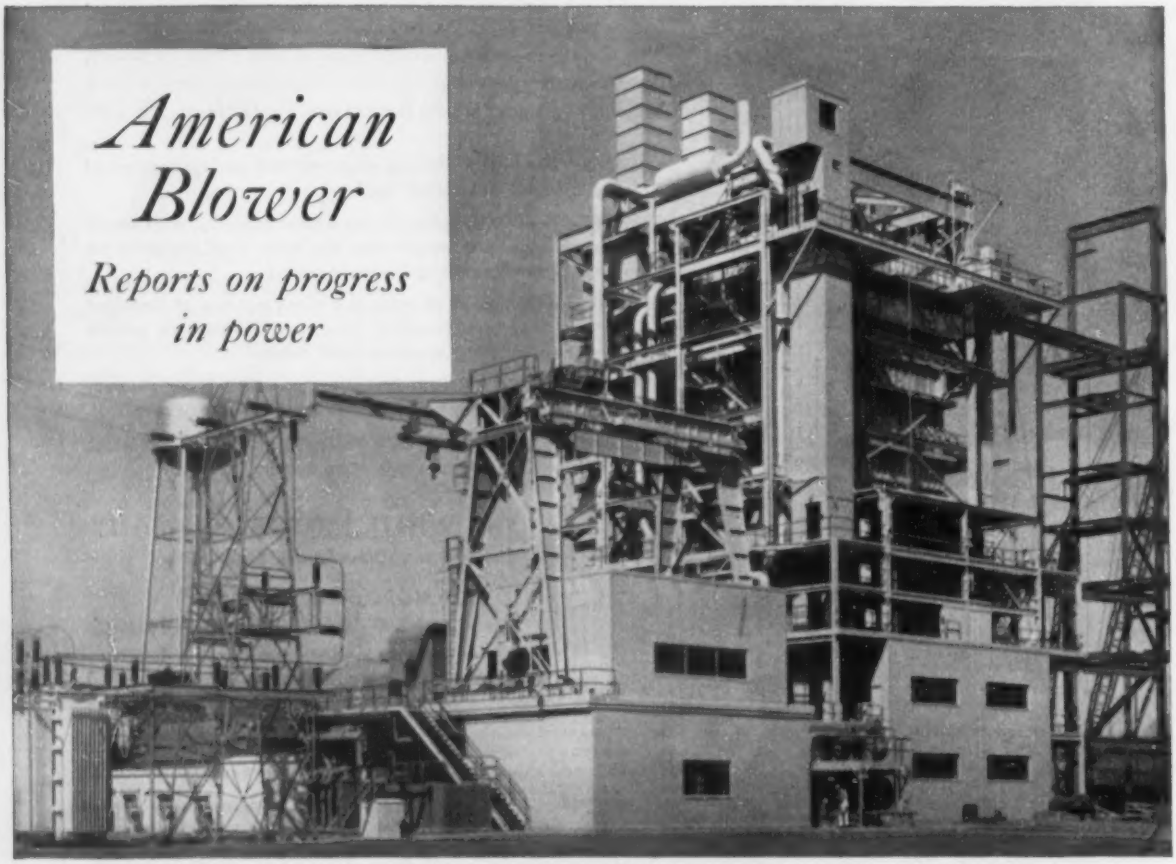
THE GREATEST NAME IN TRUCKS

SOUTHERN CALIFORNIA EDISON CO. is now operating a fleet of 23 line trucks like this one . . . 25 more slated to go into service soon! Here is modern efficiency in overhead line work . . . real time savings because of short turning radius, wide-tread front axle and short wheelbase . . . amazing power with the new, more powerful White Mustang engine.

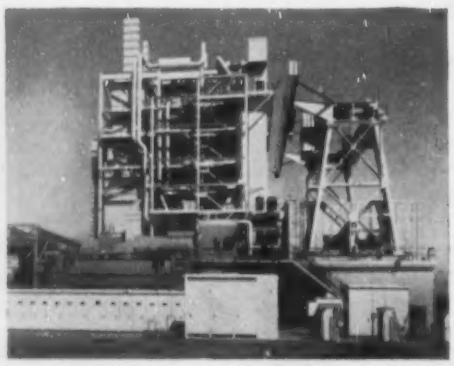
THESE line trucks have 127½-inch wheelbase, White 250A Mustang Engine, 10.00 x 20 tires, 12-ply, with 6231B auxiliary transmission and top-mounted power take off.

Southern California Edison serves 3.4 million people in an area of 14,250 square miles. There are 7,546 employees.

Dallas Power & Light Co. Sirocco Fans for Parkdale



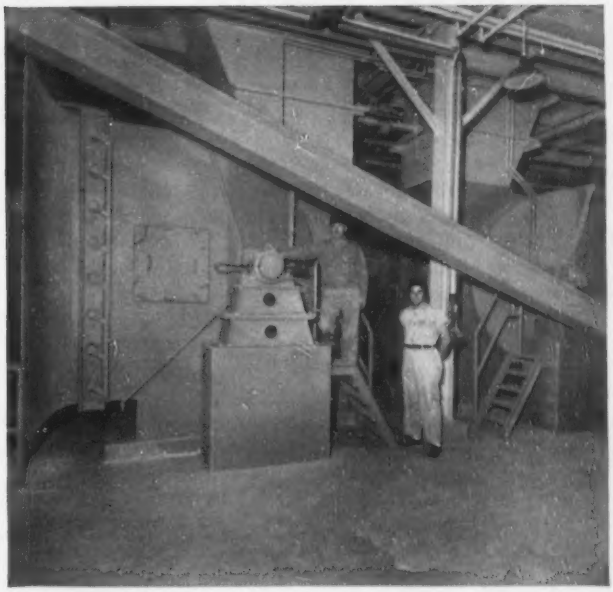
DP&L's No. 1 unit at Parkdale Plant has 87,000 kw generating capacity. The No. 2 unit, now under construction (far right) will add an additional 115,000 kw of capacity.



DP&L expansion program will increase capacity 48 per cent in two years

Two 115,000 kilowatt generating units under construction at Dallas Power & Light Company plants would have served all of metropolitan Dallas' electrical needs as late as 1949. One of the two new units is shown at left at Parkdale Plant, and the other is being built at DP&L's Mountain Creek Plant. Together, the new generators will increase the company's capability 48 per cent by the end of 1956. They will help meet peak demands on DP&L's system which have risen at an average rate of 17 per cent each year since 1946.

chooses Plant



Two American Blower Forced Draft Fans are in operation at the Parkdale Plant. Capacity of each is 123,500 cfm at 100° F at 29" sp. Each fan is driven by an 800-hp motor.

PARKDALE PLANT, newest of Dallas Power & Light Company's generating stations, is the Company's first station to use a pressure furnace. For its initial unit and for Unit No. 2, which is scheduled for completion early in 1955, Dallas Power & Light Company selected American Blower Sirocco Forced Draft Fans.

American Blower Sirocco Fans have long been favorites with progressive power plant operators throughout the United States and Canada. And for good reasons! Sirocco Fans are extremely quiet in operation; they are dependable; and they are economical to run.

In addition to Mechanical Draft Fans for both forced and induced draft, American Blower manufactures Fly Ash Precipitators, Heavy-duty Steam Coils and Gyrol Fluid Drives, for smooth adjustable speed control of fans and boiler feed pumps.

If you have an air handling problem, or plan to expand or modernize your facilities, let American Blower's wide experience work for you. Contact your nearest American Blower Branch Office or write us direct.

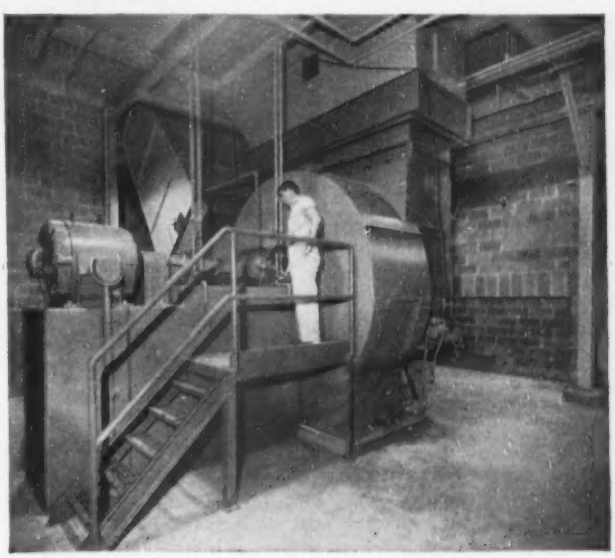


Photo shows an American Blower Recirculating Gas Fan in operation at the Parkdale Plant. Driven by a 100-hp motor, it is rated at 54,000 cfm at 775° F at 6.6" sp.

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READERS FORUM

Restacking Stators—A Job Requiring a Crane

To the Editor:

We forward our reply to your questionnaire covering our Arapahoe No. 4 100,000-kw addition under way and our Zuni (formerly Lacombe) No. 2 66,000-kw addition recently placed in service. Neither of these units has been previously reported upon.

For the first time you have requested information on crane size in your third round-up of new station design characteristics.

There is a trend toward providing crane capacity to handle all turbine generator parts other than the generator stator. The reasoning seems to be that the stator will never require handling after its initial installation. However stators do require lamination restacking, and to our knowledge such stacking is best performed with the stator upended. The manufacturer does not assure us that an adequate job can be performed with the stator horizontal and in place. The facts are that laminations are occasionally damaged in service. How then can a stator be up ended without an adequate "sky hook" such as a full sized crane?

If full sized cranes are to be omitted, then the manufacturer should incorporate features on the stator so that it can be raised vertically and then by trunnions rotated to a vertical position on the pedestal foundation.

A very dim view is being given this problem, the predominate view being to make the investment saving and let the future take care of itself. However, many other plant design items are not so handled.

A full-sized crane can never be justified on the savings made at the time of installation. It must be further justified on the basis of its future need for up-ending the stator. More stators require re-lamination than many designers making responsible decisions are aware of. Probably our meager experience is not typical or average, but in the past 20 years we have restacked three stators involving weights up to 100 tons. We once attempted a horizontal procedure as a cost saving item, employing special guides, etc, and upon completion of the work, the slots were so irregular that the job was redone by up ending the stator. Fortunately we had an adequate crane for such purpose.

A future questionnaire might well develop the lamination failure of stators over the past 10 or 20 years, whether the restacking was done on its foundation in vertical or horizontal position, whether the stator was returned to the vendor's shop, whether it was removed from the foundation and repaired on the ground in the open employing gin poles, etc, or a hired railroad derrick, or whether the station crane handled it.

R. F. Throne
Chief Mechanical Engineer
Public Service Co of Colorado
Denver, Colo.

Overhead Distribution—Is It Cheap?

To the Editor:

Pictures in the Sept. 13 issue (p 9) of the storm damage caused by "Carol's" binge, illustrate again the need for underground power distribution. That service can be restored under such rigorous conditions in such a short time is indeed remarkable. But equally remarkable is the apparent fact that our highly technical utility industry is willing to spend untold millions of dollars patiently rebuilding smashed up systems decade after weary decade.

Yes, overhead is cheaper than underground. But whether the funds for rebuilding after each prank of nature are derived from insurance, from heavier investments, or from higher rates to the customer, the loss is there just the same—loss of lives, of property, of revenue, and certainly of customer good-will.

Burying the distribution system will not eliminate tornadoes, sleet storms, and hurricanes but will help to soften the shock by:

1. Eliminating the dangerous cobweb of broken wires and tumbled poles after each storm.
2. Providing power for emergencies, pumps, and lights at the very time when they are needed the most.
3. Eliminating the need for those super-human efforts of the repair crews and the difficult transportation problems when streets are cluttered with fallen trees.
4. Reducing the tremendous drain on our forest resources.
5. Preserving some aspect of beauty in residential and downtown commercial areas of our cities and towns.

Why must overhead distribution systems be so ugly?

Carl T. Grauer
Univ. of Calif. Rad. Lab.
Livermore, Calif.

Adequate Wiring—an Inadequate Term

To the Editor:

Your Aug. 9 issue poses the question, "Adequate for What?" relative to the letter from Harold Seitz?

And that brings up another question. Can't we get something better than the awkward and uninteresting phrase "adequate wiring?"

Seems like some of us should be able to come up with a better phrase. That one certainly has whiskers on it.

A wiring job that's adequate today will most certainly be inadequate tomorrow. We are trying to urge folks to wire their homes completely to provide for tomorrow's happier living—electrically! A large building project here, which has installed 100-amp entrance switches in low cost housing units, advertises "Wired for Tomorrow." That's getting close, but I believe someone can come up with something really worth while if we kick it around a bit.

M. B. McDonald
Vice President
Florida Power & Light Co
Miami 30, Fla.

General View of Hutsonville Power Station
Central Illinois Public Service Co.
Sargent and Lundy
Consulting Engineers

Bartlett-Snow coal handling at *Hutsonville*

● There have been many changes at Hutsonville, all engineered by Bartlett-Snow to Sargent and Lundy specifications,— the equipment fabricated in our shops and installed by our erectors. The first installation in the small, original plant (view at right) consisted of 24″ belts with capacity of 150 tons per hour. This system was then increased to 200 tons per hour capacity. More recently for a large new plant addition we have added an entirely new system with storage conveyor, weightometer, crusher and 36″ belts with 400 tons per hour capacity. These new conveyors were installed directly on top of the original conveyors, that continue to serve the original building, and tied into the first system without shutting down the plant for even an hour. For fixed responsibility that insures the highly efficient, synchronized operation of the entire system as a unit, low maintenance and low operating costs, let the Bartlett-Snow coal handling engineers work with you on your next new plant, modernization or plant extension program!

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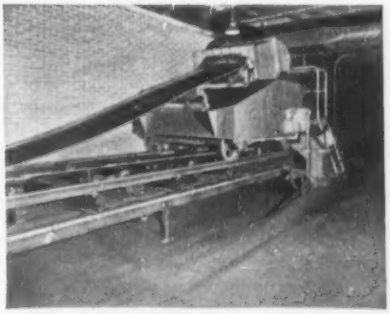
View of the Original 50,000 KW Station Showing the 150 Ton/Hr. Coal Handling System



View of Distributing Belt, Belt Tripper and Dust Tight Bunker Seal in New 100,000 KW Addition

EUGENE GORDON HENRY H. STARTZMAN S. SIDNEY BRADFORD

Potomac Edison Elects 3 VP's

Executive posts are assumed by Gordon, Startzman, and Bradford. Vice President Humphrey retires

Potomac Edison Co has elected three new vice presidents. They are: Eugene Gordon, Henry H. Startzman, and S. Sydney Bradford.

Gordon will serve as vice president in charge of power stations and power generation; Startzman, operating vice president; and Bradford, commercial vice president.

The utility also announced the retirement of George S. Humphrey, vice president of the Potomac Edison System.

Retiring Vice President Humphrey will continue to serve as a director of the company and chairman of the West Penn Electric System Engineering and Construction Committee pending completion of a number of large power plant projects throughout the system.

Joined Utility in 20's . . . Gordon has been associated with Potomac Edison's power department since 1923, starting as assistant chief engineer at the R. Paul Smith Plant in Williamsport. In 1924 he was appointed chief engineer at that station. He served in that capacity until 1936, when he was promoted to the post of plant superintendent, also at the Williamsport (Md.) station.

He was transferred to the utility's Hagerstown (Md.) general offices in 1938 to work as superintendent of power production. In 1951 he was made superintendent of power stations for the Potomac Edison System. He also assumed additional duties in connection with the West Penn Electric Co system generating facilities. He is presently serving on a temporary loan basis with West Penn Power Co as acting manager of its power department.

Filled Retail Sales Post . . . New Operating Vice President Startzman started his career with Potomac Edison as retail sales manager in Cumberland, Md., in 1928. Later that year he was transferred to the Hagerstown offices as industrial engineer. He held this post until 1936 when he was advanced to manager of power sales and engineering.

Startzman served in this capacity until 1948 when he was made assistant chief engineer at Hagerstown. In 1951 he was named assistant vice president and chief engineer, later advancing to operating manager and chief engineer.

Commercial Vice President Bradford has been with Potomac Edison's promotional department since 1934 when he assumed the post of promotional manager. He was appointed promotional manager for Potomac Edison in 1935 and held this post until 1953 when he was designated general commercial manager, a position he held until the recent promotion.

Humphrey's career in the utility field began in 1910 when he joined Telluride Power Co at Provo, Utah. From 1913 to 1918 he was affiliated in an engineering capacity with Utah Power & Light Co and a predecessor, Knight's Consolidated Power Co. Then he went to the West Penn Electric System, serving as an electrical engineer for Potomac Edison's sister company, West Penn Power. In 1928 he came to Potomac Edison as vice president in charge of operations and engineering.

•

R. C. Grimstad, formerly manager of the rate department, has been made technical assistant to the vice president of the Sales Division of Duquesne Light Co. Grimstad, an electrical engineer, joined the company in 1926.

Henry C. Stricker, Jr, has been named chief engineer of Highway Trailer Co, Edgerton, Wis. Stricker, who received engineering training at University of Wisconsin and University of Belfast, Ireland, joined the Highway Trailer engineering staff in 1946.

Patrick J. Selak has joined the Atomic Energy Division of Kaiser Engineers Division, Henry J. Kaiser Co. He will aid in development of industrial and research applications of nuclear energy. He formerly was with the Atomic Energy Commission.

New Positions Created by Seattle City Light

Several new positions have been created in an administrative reorganization of Seattle City Light, already approved by the City Council and scheduled to go into effect next year.

The new positions are executive assistant superintendent, chief engineer, chief of operations, and administrative assistant.

John M. Nelson, an assistant superintendent, will become executive assistant superintendent, under the new program. He will have general supervision of the department subject to the approval of Superintendent Paul J. Raver, whose duties he will assume when Raver is out of the city or on vacation.

The other new positions will be filled within the department's present personnel, said Raver.

P. C. Spowart and Ira L. Cottom, assistant superintendents in charge of commercial sales and properties respectively, will continue in those positions with salary increases.

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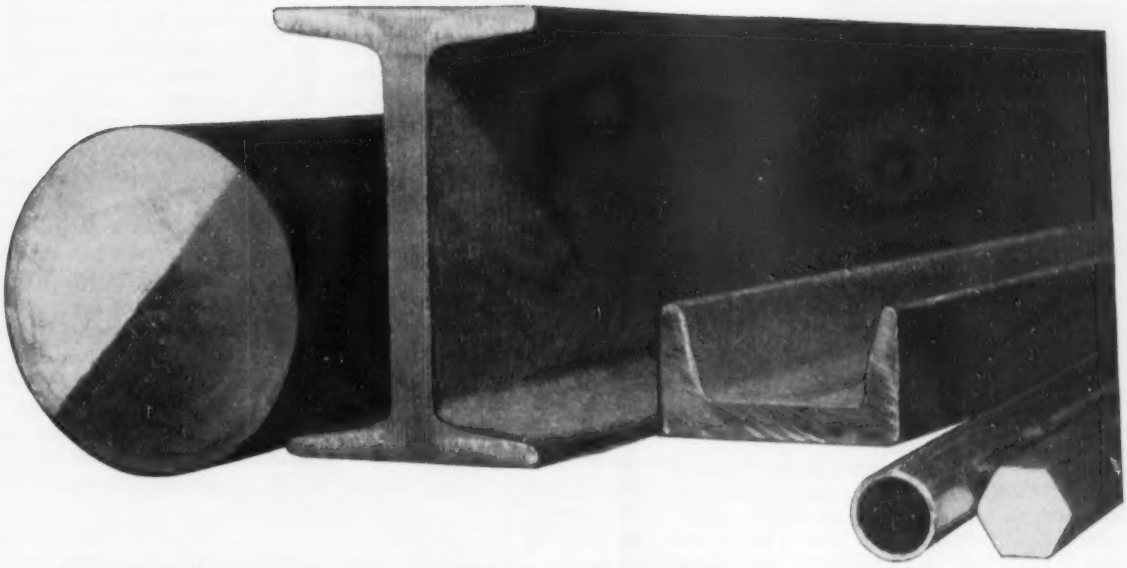

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Dependable PHOTOELECTRIC
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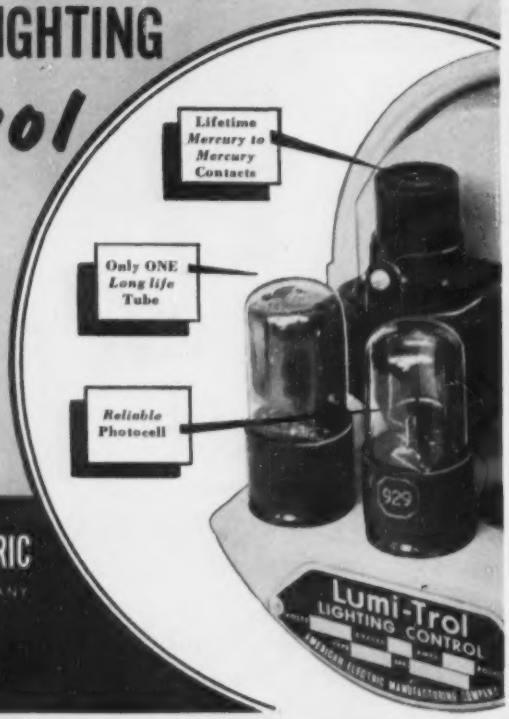
Control

Proven dependability in jobs where others fail. Absolutely trouble-free. Every control factory tested — and guaranteed — to meet specifications.



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MANUFACTURING COMPANY
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Fold up your derrick from inside the cab!

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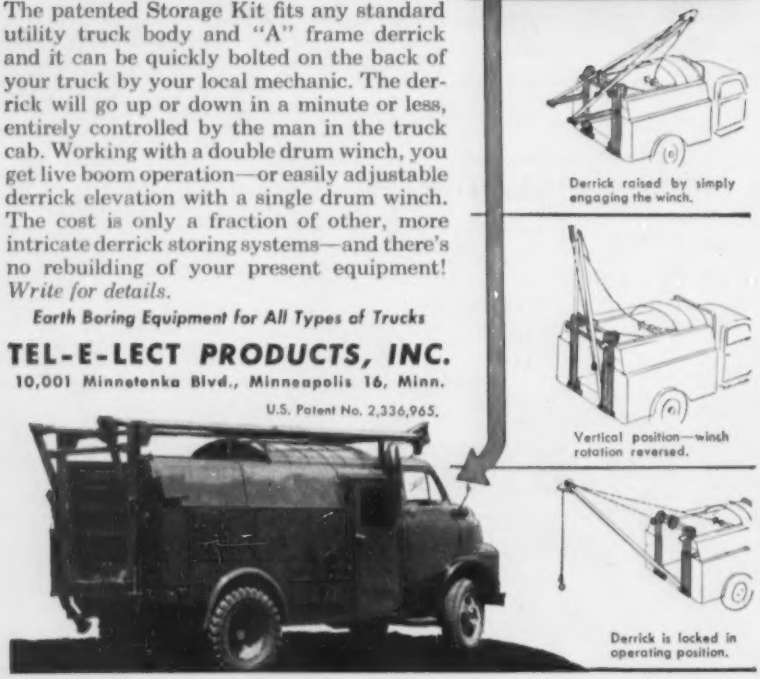
TEL-E-LECT STORAGE KIT

The patented Storage Kit fits any standard utility truck body and "A" frame derrick and it can be quickly bolted on the back of your truck by your local mechanic. The derrick will go up or down in a minute or less, entirely controlled by the man in the truck cab. Working with a double drum winch, you get live boom operation—or easily adjustable derrick elevation with a single drum winch. The cost is only a fraction of other, more intricate derrick storing systems—and there's no rebuilding of your present equipment! *Write for details.*

Earth Boring Equipment for All Types of Trucks

TEL-E-LECT PRODUCTS, INC.
10,001 Minnetonka Blvd., Minneapolis 16, Minn.

U.S. Patent No. 2,336,965.


Derrick raised by simply engaging the winch.
Vertical position—winch rotation reversed.
Derrick is locked in operating position.

W. L. BRESLIN

RMEL Elects Breslin as Its New President

W. L. Breslin, president of Western Public Service Co, Laramie, Wyo., has been elected president of the Rocky Mountain Electrical League. Breslin, a former vice president of RMEL, succeeds Marshall M. Koch, vice president in charge of electric operations for Public Service Co of Colorado.

RMEL also elected these officers: As vice president for Colorado, D. B. Hyer, Jr, Southern Colorado Power Co; as vice president for Wyoming, K. E. Darling, Southern Wyoming Utilities Co; as vice president for other divisions, L. M. Stauffer, General Electric Co, of Denver; as treasurer, H. A. Mitchell, Public Service Co of Colorado; and assistant treasurer, E. G. Armstrong, Colorado Central Power Co.

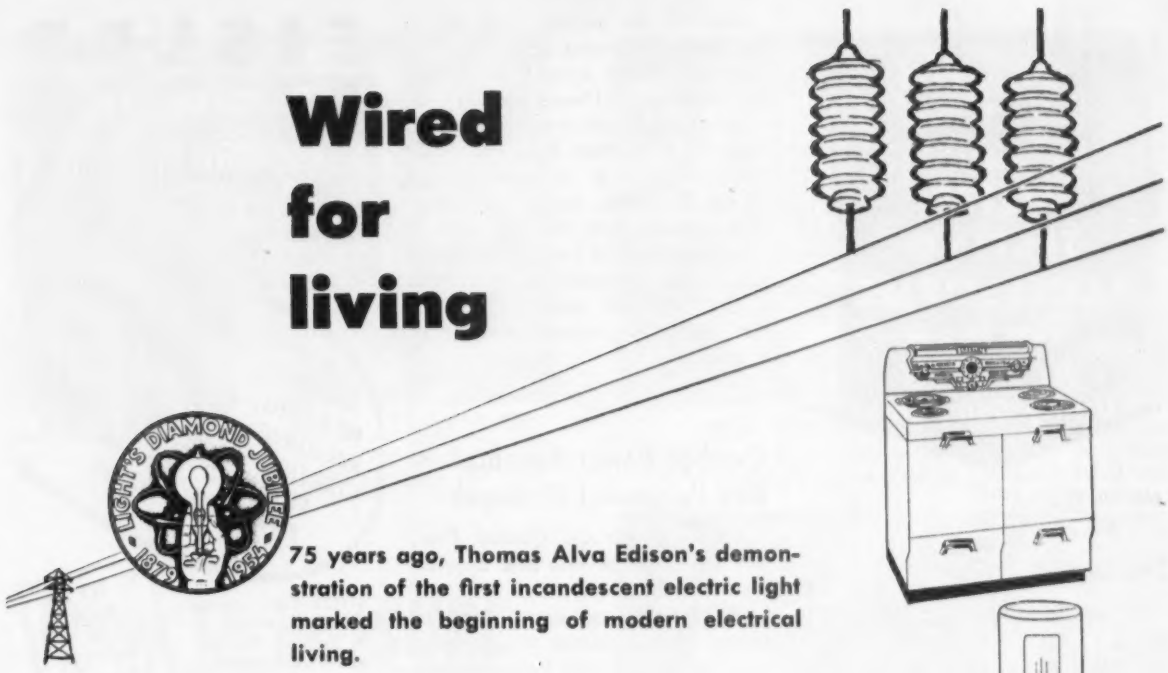
After graduating from Harvard College in 1922, Breslin started with Stone & Webster Service Corp. Subsequently he worked with Stone & Webster companies in Seattle, Tacoma, Tampa, Savannah, and Scottsbluff, Neb., in various positions. He became president and director of the present Western Public Service Co when it was organized in December, 1941.

•

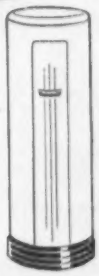
Harold M. Towne, manager of sales of lightning arresters and cutouts for the General Electric Co, retired on Oct. 1. He joined GE in 1909.

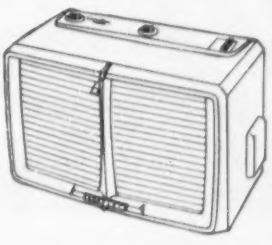
Harold W. Collins, general superintendent of Detroit Edison Co's electrical system since 1945, has been advanced to the post of special as-

Wired for living



75 years ago, Thomas Alva Edison's demonstration of the first incandescent electric light marked the beginning of modern electrical living.





Contributing to this new way of living, the Crosley and Bendix Home Appliances Divisions of AVCO have pioneered in the development of time- and labor-saving kitchen and laundry aids to make electrical housekeeping more efficient, more convenient, more enjoyable. Because of tremendous consumer demand and the application of mass production methods, many of these home appliances, once considered luxuries, have become an everyday part of American living.

Appliances such as dryers, ranges, water heaters and air conditioners particularly have placed a heavy demand on electric service companies, and to this demand utilities have responded with the spirit of enterprise that has made the electrical industry great.

We at Crosley and Bendix Home Appliances will continue to produce new and better products in the future. And by our promotional efforts with local power companies, we intend to make the public continually more appreciative of the advantages of living electrically.

We would like to help with *your* electric usage promotion. Contact your local Crosley or Bendix Home Appliances Distributor or write to Crosley and Bendix Home Appliances Divisions, AVCO Manufacturing Corp., 1329 Arlington Street, Cincinnati 25, Ohio.

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HOME APPLIANCES DIVISIONS AVCO MANUFACTURING CORPORATION CINCINNATI 25, OHIO

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Now in use
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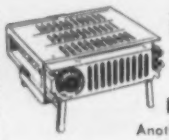
This equipment is extremely small and compact. Designed for the testing of socket type meters of 5, 15 and 50 ampere capacity, 2 and 3 wire single phase.



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Another resistance load in a series which we believe to be radically different in design and construction from any devices heretofore manufactured for this purpose.

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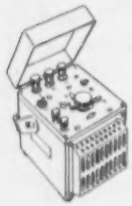
Designed to reduce the weight of portable equipment to the lowest possible limit. Total weight, less rotating standard and leads is 12½ pounds. 18" long, 7¾" wide and 10½" high.



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This was designed for general purpose testing of all meters up to 50 ampere capacity. Like all other loads of our manufacture, the H-50 load is rated for continuous duty. Weight 12 lbs. net.

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sistant to the utility's manager of engineering, Howard P. Seelye. Assuming Collins' former duties will be **Delmar D. Chase,** formerly assistant superintendent of the electrical system. **F. Clifford Pohl** takes over Chase's previous assignment and **Ernest W. Spring,** former staff assistant, replaces Pohl with the title of superintendent of electrical system equipment. **Howard R. Stevenson,** former assistant manager of sales, was appointed assistant manager of operations.

Quebec Power Reveals Key Personnel Changes

Quebec Power Co, Quebec, Can., has announced several new appointments.

Henri F. Beique, general superintendent, was appointed assistant general manager. Lionel Swift, superintendent of the Electricity Division, was made general superintendent of operations. Both Beique and Swift are electrical engineers.

Formerly assistant superintendent of the Electricity Division, Maurice D'Amours, an electrical engineer, was named superintendent of operation of that division.

Pierre A. Duchastel, an electrical engineer, has relinquished the post of superintendent of the engineering department to become chief engineer. G. F. Kelly, assistant superintendent of engineering department, was designated assistant chief engineer.

New director of supplies for Quebec Power is Charles F. Scribner, who formerly filled the post of chief of the Supply Division.

Beique, Swift, Duchastel, and Kelly are members of American Institute of Electrical Engineers.

Frank J. McGuinn was promoted to sales manager in the Irvington (N. J.) Varnish & Insulator Division of Minnesota Mining & Manufacturing Co. McGuinn, who joined Minnesota M&M in 1948 as an electrical products salesman, will be responsible for sales training and assistance on Irvington's electrical insulating products. For the past four years he has been handling industrial electrical trades for Minnesota M & M in the Buffalo, N. Y., region.

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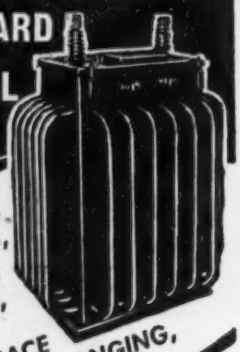

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SAFETY—tested to withstand 105,000 volts.

EFFICIENCY—compound lever cutting head easily snips branches up to 1⅛ inches.

STRENGTH—Laminated Sitka Spruce poles and finest tool steel blades insure ample strength and long service.

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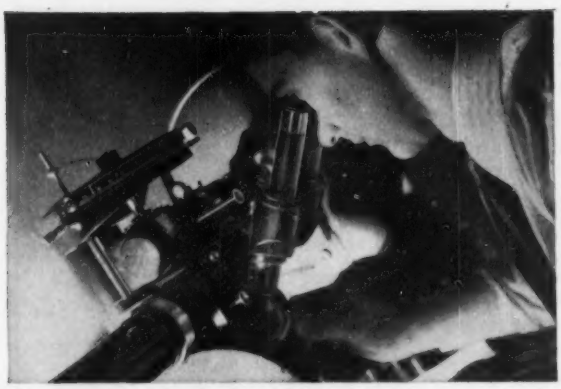
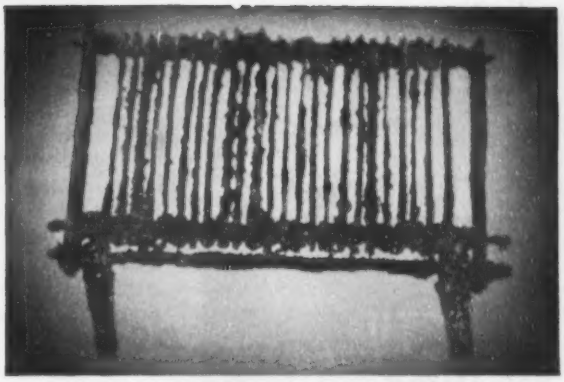


LABORATORY TESTING—The modern Chase laboratories provide an excellent testing ground for condenser tubes under conditions met in many varied industries.



FIELD TESTING—This rack of test specimens was in a heat exchanger. These field tests help Chase perfect the alloy best suited for *your* job.

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Take Chase Antimonial Admiralty or Cupro-Nickel Tubes, for instance. You *know* they'll give you years of service. They're manufactured under carefully controlled conditions. They're tested for every stress, strain and attack. They're inspected again and again. When a Chase condenser tube goes into service we're *sure* it will stand up. You can be sure, too.

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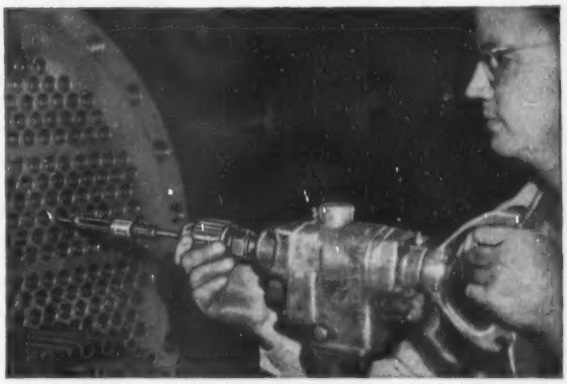

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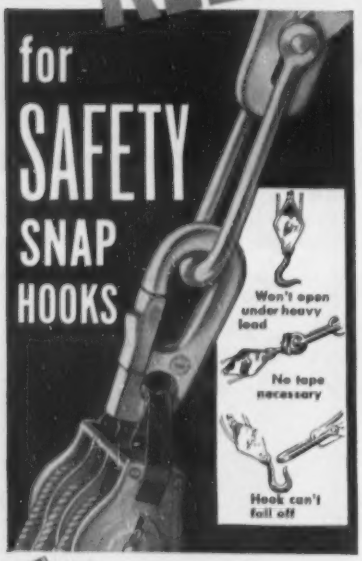

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Here's strength, safety on heavy loads—for blocks, tackles and hoists. Klein Safety Snap Hooks are time savers, too, eliminating the necessity of taping or wiring the throat. Made of drop forged steel—carry a working load of 8,000 pounds with adequate safety factor. Snap on easily with one hand—may be used on any conventional steel block 6 inches or smaller, or on chain hoists or snatch blocks. Four types regularly available. Specify 455-SH-3 Snap for use with 1½-ton hoists . . . No. 455-SP for double chain hoists and for attachment at housing. Klein can also supply safety snap hooks for lighter loads.

455-S Swivel Eye

455-SH Swivel Eye

Foreign Distributor: International Standard Electric Corp., New York

455-SP

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OBITUARY

Edward F. Kelly, Sr, 71, retired 40-year veteran of Central Illinois Public Service Co who served as vice president, a director, and chairman of the board, died Sept. 26 at Springfield, Ill. He joined Central Illinois Public Service in 1913. He was named a director in 1930, a vice president in 1932, and board chairman in 1949. In 1953 he retired, but continued as a director until his death.

Francis J. Dolan, 63, assistant secretary of Combustion Engineering, Inc, and general manager of the Superheater Co Division, died Oct. 2. Dolan, who started with Superheater Co in an executive capacity in 1933, was made general manager of the Superheater Co Division of Combustion Engineering in 1952.

George C. Sears, 70, who retired last year as superintendent of Power Supply Division of Puget Sound Power & Light Co, died Sept. 28 at Seattle, Wash. Sears started work as a substation operator for Puget Sound Electric Railway, a forerunner of Puget Sound P&L. Later he was the company's engineer on design and construction of Rock Island Dam on the Columbia River and served as division superintendent for more than 20 years.

Walter H. Henry, 61, senior consultant in charge of General Electric Co's manager development consulting service, died Oct. 6 at White Plains, N. Y. He joined General Electric in 1919 as fractional horsepower sales engineer in Chicago.

George A. Jessop, 71, consulting engineer for the S. Morgan Smith Co, York, Pa., died in an automobile accident Sept. 24 while returning from a meeting of National Electrical Manufacturers Association at Hershey, Pa. Jessop, who began with the company in 1901, was made in 1923 chief engineer for the firm, a position he held until his retirement in 1949.

William B. Petzold, 43, supervisor of design for General Electric Co's laminated and insulating products department, died Sept. 25 at Chicago.

Joshua T. Day, 83, retired vice president and general manager of Malden (Mass.) Electric Co, died Sept. 24.

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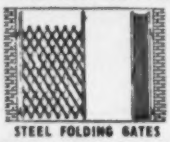

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As Electrical Engineer

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October 1, 1954

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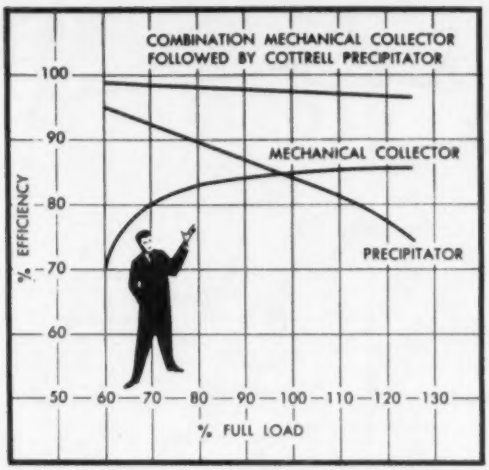

Advantages of the Western Precipitation CMP Unit

for recovering solids from stack gases in public utility operations

The control and recovery of fly ash from stack gases has always been a troublesome problem in public utility operations. With the development of the CMP unit by Western Precipitation Corporation, new economy and efficiency in the solution of fly ash problems are now possible.

Almost a half century ago Western Precipitation pioneered the first commercial application of the now-famous Cottrell Electrical Precipitator to recover suspensions *electrically*, and this equipment is still unsurpassed in its field.

Subsequently, to provide efficient fly ash recovery for low cost installations, Western Precipitation also pioneered the first small tube *mechanical* recovery unit — the Multiclone Collector — and this unit promptly gained widespread recognition for the new efficiencies it brought to mechanical recovery processes.

Combination Multiclone-Precipitator Unit. From these years of experience gained in both Cottrell and Multiclone installations, Western Precipitation recently offered another new development — the CMP Unit — a unit that combines in one compact installation many of the best features of both electrical and mechanical recovery methods.

In a typical CMP Unit, the stack gases first pass through a Multiclone section where the heavier materials are removed *mechanically*.

The partially-cleaned gases then pass through a Cottrell section where the very small particles are removed *electrically*.

This arrangement offers several advantages important to public utilities. Removing the heavier particles by the Multiclone process permits the bulk of the recovery operation to be performed with relatively low-cost equipment. Using a Cottrell for the final clean-up insures unusually high recovery efficiency — approaching theoretically perfect, if desired. Thus, the CMP combines high recovery efficiency with low total cost . . . and, as shown in the chart above, has the further advantage that the efficiency curve of the Multiclone portion complements that of the Cottrell portion — *therefore the overall CMP efficiency remains practically uniform at all boiler loads.*

> At low boiler loads the recovery efficiency of the Cottrell is highest, while that of the Multiclone reaches its maximum at high boiler loads. But, by combining the two types of equipment into a *single* CMP unit, the efficiency curve remains almost flat whether the boiler load is low or high.

With CMP equipment, even small utility companies can now afford adequate fly ash recovery. However, it is important to remember that full benefit of the CMP principle can be obtained only by a proper balance between the mechanical and electrical sections to fit the individual requirements of *each individual* installation. And no organization is better equipped to provide this critical "know-how" than the organization that provides integrated responsibility for Cottrell, Multiclone and CMP methods . . . *the Western Precipitation Corporation.*

This unique background of experience in the solution of fly ash recovery problems is available from our office nearest you. May we give you more complete details?

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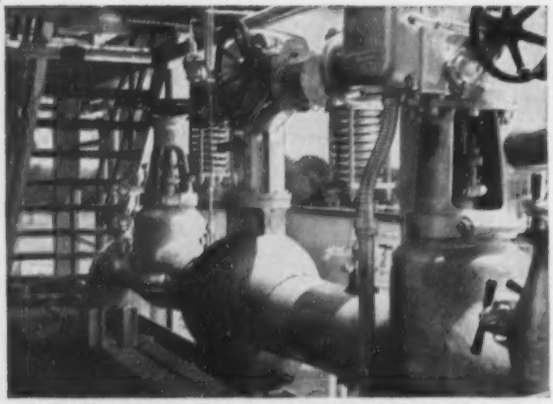
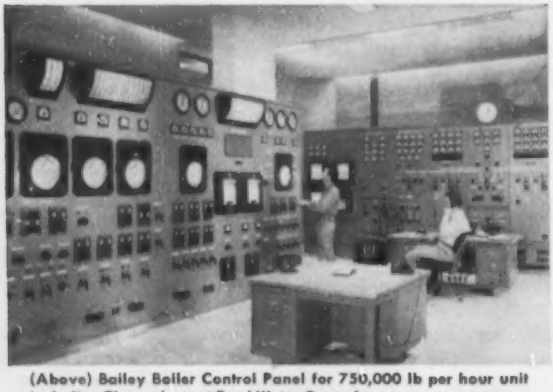


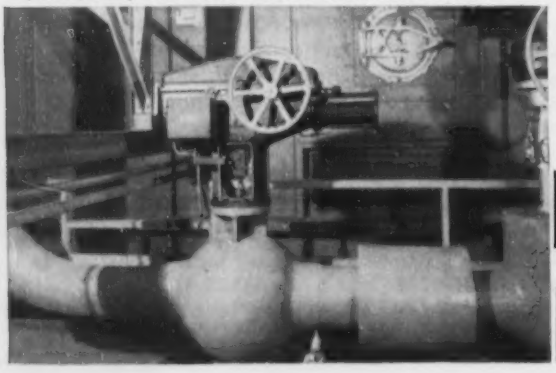
Bailey Three-element Feed Water Control Valve is feed line to a 450,000 lb per hour boiler.

Operator's station for Bailey Three-element Feed Water Control is located in this compact control room.



(Above) Bailey Boiler Control Panel for 750,000 lb per hour unit including Three-element Feed Water Control.

(Below) Bailey Control Valve in feed water line to above unit.



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Bailey Is Your Best Buy in

More than 1000 large boiler units are equipped with Bailey Three-element* Feed Water Control for close regulation of drum level, added safety, and added efficiency.

That Bailey is better than a 2 to 1 favorite against the combined total of all other makes used in this service is borne out by checking the 173 steam-electric stations listed by Electrical World in its design issues of May 8, 1950 and April 7, 1952. No wonder we can say Bailey is your best buy.

Such an endorsement by users of power equipment doesn't just happen. It's the result of carefully weighing all factors: design superiority, accuracy of operation, dependability in service, and the experience of the

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manufacturer in building and servicing this type of equipment.

That's why you should check with users before you buy. And you'll find a Bailey user near you. We couldn't spot over 1000 installations on one small map—but from those we were able to show, you can get some idea of Bailey's universal popularity—and how easy it is to get service with a minimum of travel time and expense. Call your nearest Bailey Office—they will be glad to arrange an inspection tour for you. And if you want catalog information, including a list of users, write for Bulletin 105-C Bailey Meter Company. A-123-2

*The three elements are—1. Steam Flow from Boiler
2. Water Flow to Boiler
3. Water Level in Drum

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PRESSURE
LIQUID LEVEL
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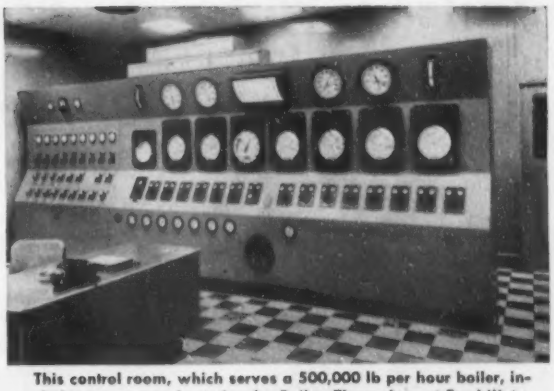
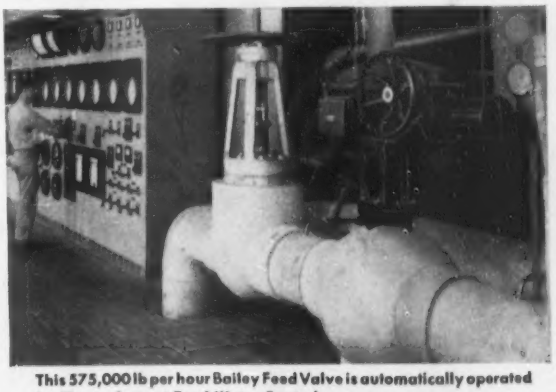


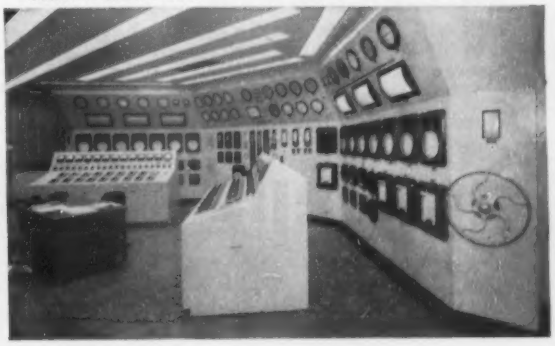
This control room, which serves a 500,000 lb per hour boiler, includes an operator's station for Bailey Three-element Feed Water Control.



This 575,000 lb per hour Bailey Feed Valve is automatically operated by Three-element Feed Water Control.

(Above) Operators' stations for Bailey Three-element Feed Water Control are concentrated in this centralized control room for three 250,000 lb per hour boilers.

(Below) Three-element Feed Water Control is part of the complete Bailey Control System operating two 500,000 lb per hour boilers from this control room.



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Bond Sale Made

Puget P&L sells a $25-million refunding issue. Another $25 million will be sold later

Preparing for the construction of additional generating facilities, the Puget Sound Power & Light Co of Seattle sold a $25-million refunding bond issue and announced it would seek approval of stockholders for a second $25-million bond issue to finance the expansion.

The first $25-million issue, sold to Eastern investment groups, will consist of 30 year 3½% first mortgage bonds. It retires $20,613,000 bonds bearing 4¼% interest, due in 1972, representing a saving of about $2 million over the remaining life of the bonds. The issue will give the company about $3,750,000 for new construction.

No further plans were revealed for the second $25-million issue.

New Projects Need Financing . . . "The program of the Puget Sound Utilities Council to provide the Puget Sound-Cascade area with adequate low-cost electric power will require vast sums of money for new power supply projects," said Frank McLaughlin, Puget Sound P&L president. "Consequently, Puget must put itself in the strongest possible position from the standpoint of future financing so it can fully measure up to its responsibilities under the partnership concept."

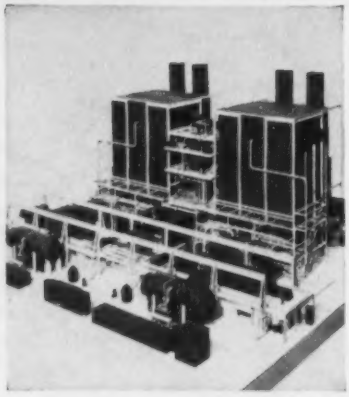
Prominent in recent meetings of the council, which also includes Tacoma and Seattle City Light, the Snohomish and Chelan PUD's, has been discussion of a proposed multi-million dollar development on the Mica Creek site of the upper Columbia in British Columbia.

Since the municipalities could not partake in construction outside the state, the responsibility for such a project would rest with Puget Sound P&L and the PUD's.

Baker River Projects . . . More immediate Puget Sound P&L projects call for a new dam on the Baker River, installation of additional generators at the existing Baker River and White River plants, and a possible expansion of the Shuffleton steam plant.

In another financial move, Puget Sound P&L's board of directors decided to ask the stockholders for per-

Industrial Models Inc.



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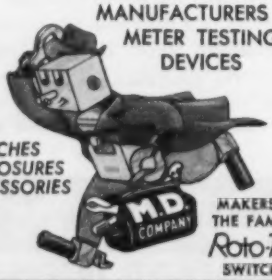

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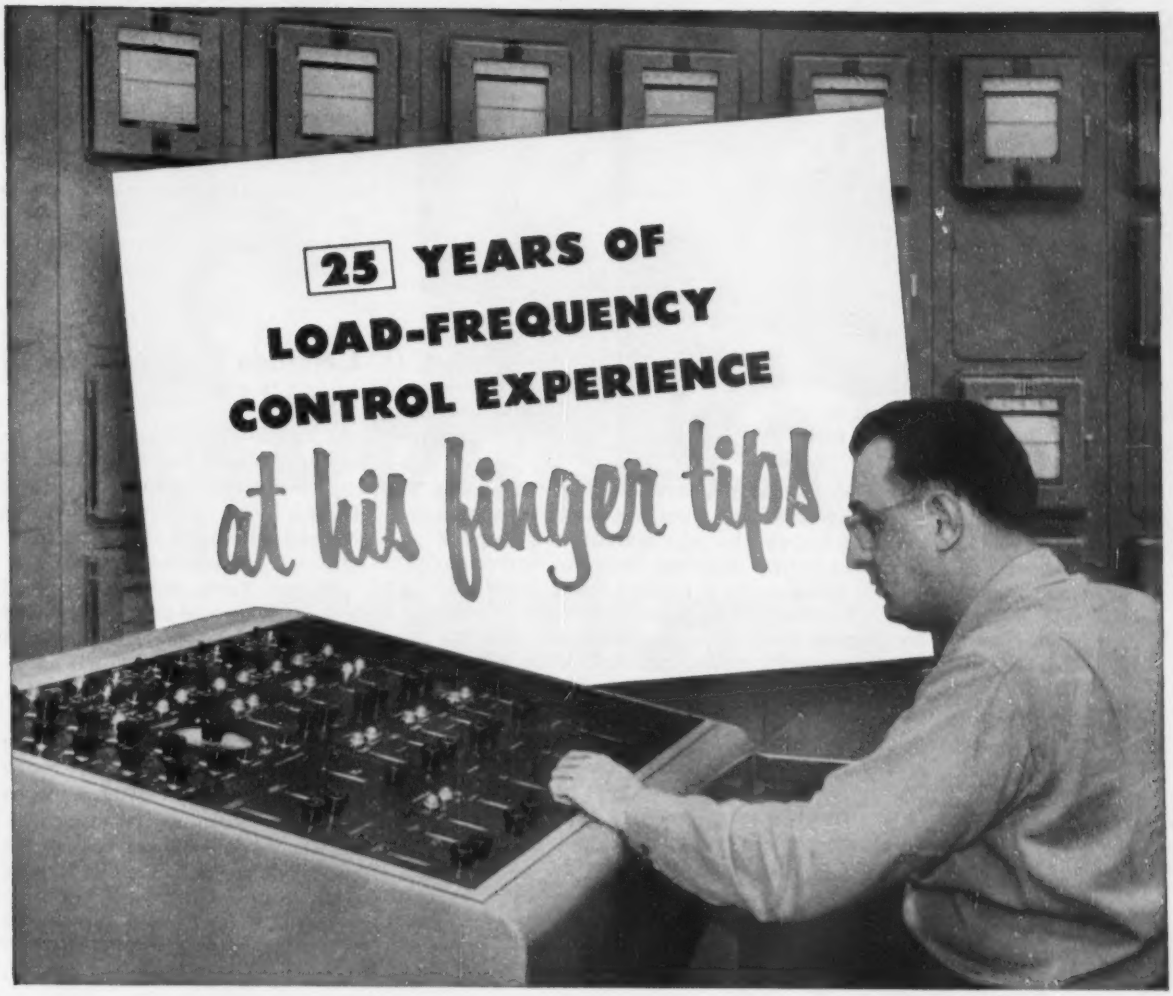

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mission to increase its number of common stock shares by 50%, the additional shares to be used for issuance of a stock dividend at the rate of one-half share for each outstanding share, subject to approval by the Washington State Public Service Commission. It also authorized company officers to make application to the New York Stock Exchange to list its common stock.

Colorado PUC Recesses Home L&P Rate Hearing

Colorado Public Utilities Commission has recessed until Oct. 25 a hearing on the application of the Home Light & Power Co for a determination of company value and a fair rate of return on its investment.

Warren Terry, vice president and general manager of the company, said the utility is seeking an increase in gross revenue of 10.98% and an increase in net revenues from the 4.81% estimated for 1954 to 6.9%.

Terry noted that the rate increase would be the first since the company was incorporated in 1909, although there have been several reductions. He blamed inflation for causing the company's net rate of return to slide downward from 6.54% in 1949.

The City of Greeley and several other Weld County towns will protest the proposed rate boost on Oct. 25.

City Light Opposes Resale of Power by Seattle Port

A petition by the Port of Seattle to the Seattle, Wash., City Council that the port commission be allowed to resell electricity to one of its tenants has met with a strong protest from Seattle City Light.

The port said it anticipated a $13,000 annual profit on the transaction, but City Light declared the figure should be nearer $25,000. Another customer has the resale privilege, City Light admitted, but only because it operates under a contract City Light inherited from the Puget Sound Power & Light Co.

Paul J. Raver, City superintendent, described the reselling of power as a "bad practice," dating back to competition between City Light and Puget Sound P&L.

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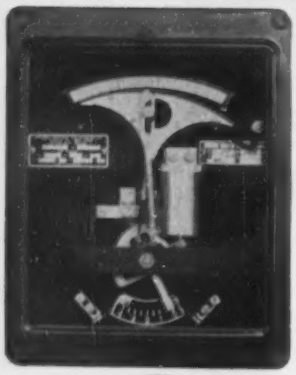

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Fight for Niagara . . .

. . . will be vigorously continued by private utility companies, Alexander Beebee declares

Fight for private development of Niagara hydroelectric power will be diligently pursued by investor-owned companies because "our whole country's future . . . is at stake," according to Alexander M. Beebee, president of Rochester Gas & Electric Corp.

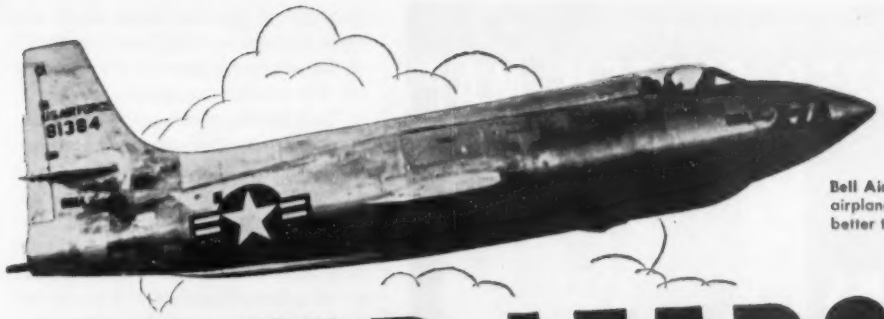
Rochester G&E is one of the five New York utilities seeking approval to construct the project. New York State Power Authority also wants authorization to develop the Niagara power.

Taxes . . . In an exclusive statement to Electrical World, Beebee said:

"The basic point at issue is whether in a democracy we can thrive with certain groups avoiding their fair share of taxes while others carry more than their fair share. This inequity is accentuated when it is proposed that in the benefits from public power preferential treatment be given to groups who likewise avoid their fair share of taxes. If anybody is to receive preference, it should be the taxpayers who made them possible . . . The equality of taxation is the nub of this whole public versus private power issue, and if equality of taxation prevailed there would be no issue. If socialization of the tools of production is the objective, then I have no point. However, when you compare the standard of living in America with countries that have socialized the tools of production, a great lesson is learned.

Interest Rates . . . "It should further be borne in mind that direct taxes are not the only taxes which public power programs avoid. The lower interest rates which they claim are primarily the result of the tax avoidance of their securities must be made up by the taxpayers.

"The above explains why we feel this Niagara issue is such an important one. It is not because of any effect on our company itself, because if the state should get permission to build a power plant and sell us so-called 'cheap power,' we do not see how we as a company would be hurt. However, state development at Niagara creates the endorsement of a



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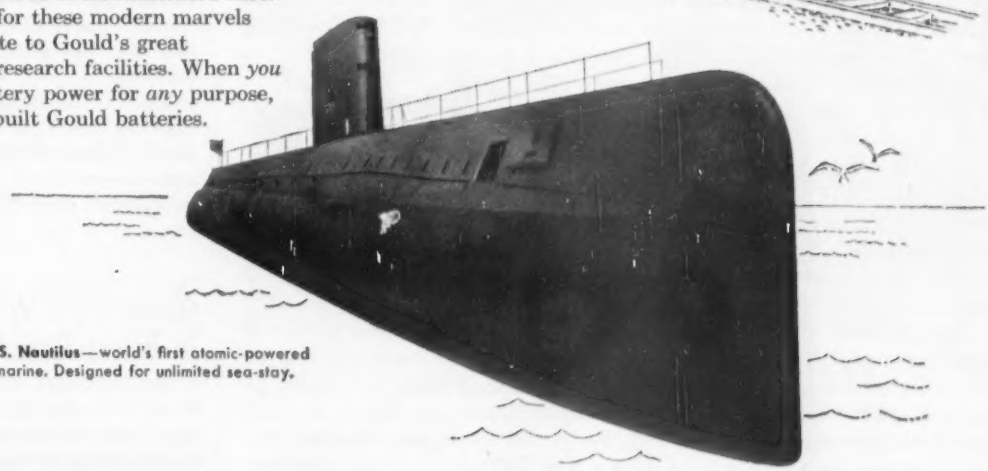

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NEW UNITIZED SYSTEM MAP
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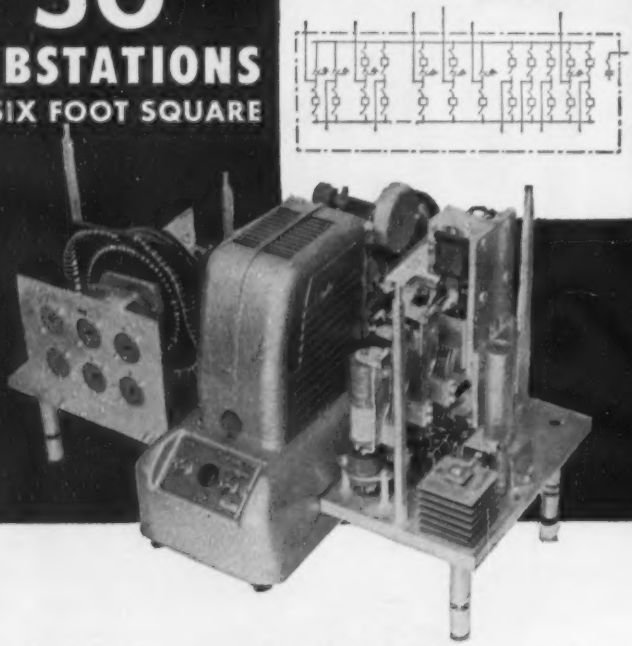
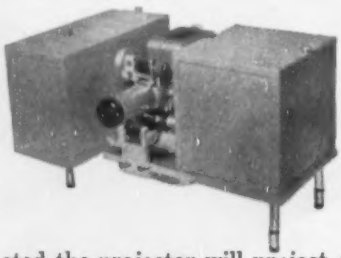
SUBSTATIONS
IN SIX FOOT SQUARE
SHOWS
BREAKER POSITIONS
IN ALL STATIONS



This unitized system map, designed for a Gulf Coast utility, fully meets the customer's requirements for compactness and low cost. In connection with supervisory control, the status of all breakers in an ultimate total of 50 substations can be quickly shown in schematic form. The cost was far less than you would expect.

The basis of this new map is an automatic projector, which can project anyone of 58 views upon a six foot screen. Red and green lamps on the front of the screen, at positions corresponding to breaker positions, are automatically connected to the supervisory control for a selected station.



Immediately after a station is selected the projector will project a one line diagram, in color, of that station on the screen, and red or green lamps for each breaker will be energized to show the status of each breaker. Only those lamps corresponding to breakers in a selected station will be illuminated. System or substation changes are easily accomplished by substituting a new film frame for the obsolete diagram. Charts and area maps can be added for easy reference.

Control Corporation's specialized experience and manufacturing flexibility made the map possible. If you have unusual requirements in supervisory control, telemetering or data presentation contact Control Corporation.

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principle of tax avoidance which can have a material effect on the future of the American way of life throughout the entire country.

"It is for these reasons, rather than because of its effect on our company, that we will pursue this matter so diligently in the months that lie ahead, so that the people can better understand it. I have often said that I have no fear as to the decision if the people generally understand the issues. It is our duty to see that they do, if the American way of life which has done so much for us all is to continue in this country."

State High Court to Hear WWP Condemnation Case

Washington State Supreme Court will sit en banc in November to hear arguments on the condemnation of the Chelan power plant of the Washington Water Power by Chelan County PUD.

This will be the fourth state supreme court hearing on an aspect of the condemnation since the district filed its original action in November 1948.

The court will hear WWP's argument that conditions have changed since the suit first was filed, and the Chelan PUD no longer needs the Chelan plant, WWP's third largest. There is plenty of other power available for the district, argue WWP attorneys.

They challenge the "constitutional right" of the PUD to take over the plant. The arguments were heard by a department of the court in June but no decision reached.

Grant PUD Wins Round in Priest Rapids Battle

Grant County PUD of Ephrata, Wash., won the first decision in its fight with Washington State Power Commission as to which agency should build Priest Rapids Dam on the Columbia River when Superior Court Judge Robert T. Hunter at Ephrata restrained the commission from interfering with the PUD's construction plans.

The commission has no authority to build the dam, Judge Hunter ruled. The 1953 law creating the commission clearly intends that the commission

would not intervene with the development of the state's power resources as long as some other agency can do the job, he declared.

Donald Watson, assistant state attorney-general, representing the commission, had attempted to prove that the PUD could not do the job at Priest Rapids. The project would be the most expensive undertaken on the Columbia, he declared, costing a minimum of $365 million. It was far beyond the capacity of a PUD in a county whose population is only 1% of the state total, Watson argued. Obviously, most of the power would have to be sold to other agencies.

The PUD's plan to build the Priest Rapids dam "is like a man with a $5,000 income trying to build a $100,000 house," said the commission's attorney.

The PUD brought the suit after the commission had duplicated the PUD's earlier action in requesting a preliminary permit from the FPC for development of the 1.2 million-kw site. The decision will be appealed to the state supreme court.

Judge Hunter held the commission had no right to intervene in the PUD's program to build the dam because it failed to hold hearings on the matter, had not announced its findings, had failed to refer those findings to the state director of conservation and development, and had no right to interfere until the PUD had failed to complete its plans. These steps were stipulated in the 1953 law creating the commission and an earlier law giving the PUD's power to build and operate dams, said the judge.

Nuclear Unit Established

American Society of Mechanical Engineers has announced establishment of a Nuclear Engineering Committee to co-ordinate its activities in areas of mechanical engineering in which a knowledge of nuclear physics is essential. Among the areas are core design, shielding, waste handling, fuels and fuel fabrication, radiation effect, special equipment, and operation of nuclear power plants. It was emphasized that NEC is separate from ASME's Nuclear Energy Application Committee, which is a policy group. Chairman of the new committee is Albert C. Pasini, Detroit Edison Co.

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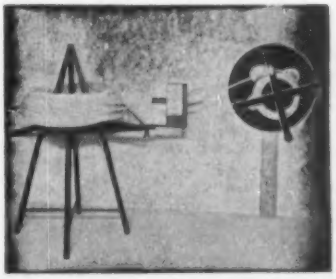

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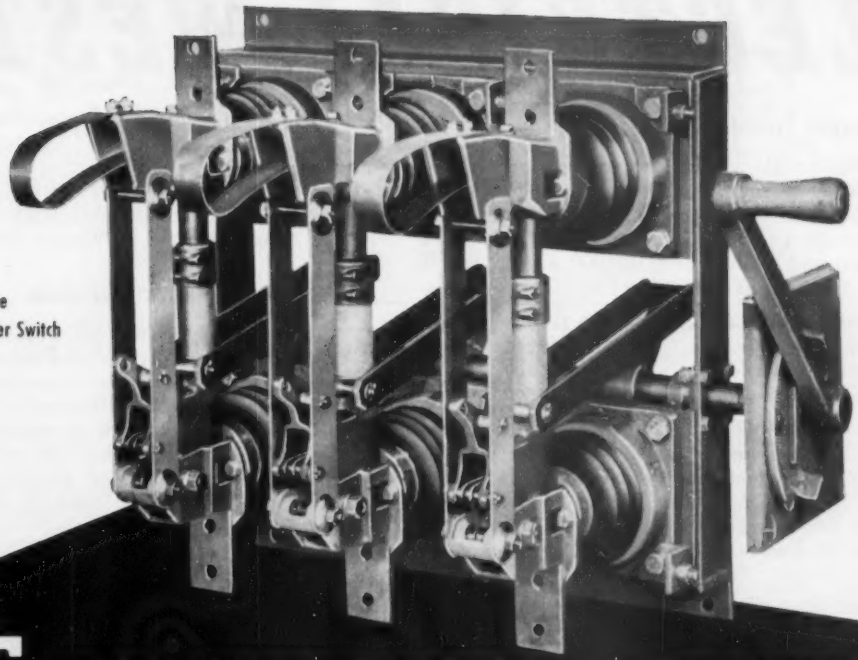

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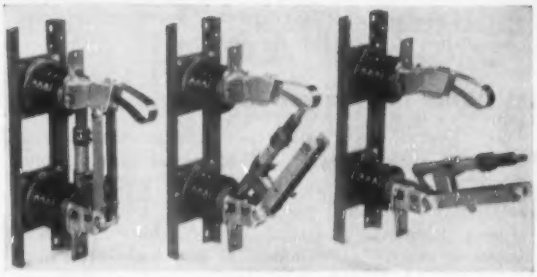
2. Interrupting charging current of lines and busses.
3. Interrupting exciting current of feeder regulators.
4. Interrupting load currents to rated capacity.
5. Sectionalizing feeders and distribution circuits.

Costing less than circuit breakers, and with the interrupting capacity not found in air break disconnects, the Three E Air Interrupter Switch is ideal for these intermediate jobs. Combined with power fuses, they offer full circuit protection where automatic restoration of service is not required. The dry type interrupter unit generates gas blasts to confine and extinguish arcs. Operation is fast, clean and efficient.

Available from 5 to 15 KV. and 400 to 600 amperes.



OPERATING SEQUENCE

As the blade starts to open the upper end of the interrupter unit engages the auxiliary contact completing circuit thru interrupter. The blade then shunts *all* current thru the interrupter (center figure). The spring mechanism trips, breaking the circuit wholly within the interrupter. Closure reverses the procedure. With the Three E, making and breaking the circuit is always done *inside* the interrupter unit and never by the blades and clips.

Ask for Bulletin 142

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ELECTRICAL ENGINEERS EQUIPMENT CO.

Melrose Park, Illinois

ELECTRICAL WEST...

1 Current Trends

Western electric market potentials are assured —the 11 Western States will continue to perform well ahead of the rest of the U.S.

Expenditures by utilities for new electrical facilities in the West will be over $750,000,000 a year. Here's a sample of what this means for 1955:

KW of new capacity	2,216,950
Miles of transmission	5,510
Miles of distribution	7,800
Kva—substations	8,170,000

Add to this the millions of dollars worth of utilization equipment and the annual growth of the Western electrical market looms large indeed. This annual growth is the same as duplicating the entire Southern California Edison system and all the load-consuming devices on its lines!

2 Basic Statistics

There are 208 electric service systems in the 11 Western States. They have 18% of the country's generating capacity, but produce over 20% of the energy consumed. In 1954 they are building 23% of the country's new transmission lines, over 17% of primary distribution lines, and about 18% of the substations.

About 225 electrical wholesale houses supply 16% of the country's electrical contractors in the West. A growing electrical manufacturing industry provides locally made equipment to utilities, contractors, wholesalers and general industry.

More than 25% of the 1,075,000 non-farm housing units started in 1953 were in the 11 Western States. For 1954 and the next several years starts are expected to be within 10% of this figure.

3 What this Market Buys

Everything a utility needs to generate, transmit, distribute and sell electrical energy, plus design, construction and maintenance services—over $750,000,000 worth a year.

Every kind of electrical construction equipment needed in industrial, commercial and residential construction, including built-in devices such as lighting, electric heating, etc.

Power consuming equipment sold through electrical and appliance wholesalers—everything from motors to traffic appliances.

4 How this Market Buys

Utilities mostly buy direct from manufacturers who sell with their own sales forces or through representatives. In the West this latter practice has been most often the case, although as the Western market has grown more and more manufacturers are establishing their own plants and sales offices on the Coast.

Electrical construction material normally passes from manufacturers through electrical wholesale houses—then to contractors who buy and install equipment used in residential, commercial and most industrial construction.

In the West this distribution pattern sprawls over 40% of the land area of the U.S. Advertising and other printed sales material plays a most influential part in selling in the 11 Western States.

5 Available Market Data

ELECTRICAL WEST has available current "Buying Power Surveys," a Fingertip Data Booklet, and statistical summaries from the Annual Review and Forecast issue. We maintain a Directory of Western offices and Sales Representatives of electrical manufacturers, a Western "Where-to-Buy" product directory, a Directory of Electrical Manufacturers' Representatives, and a Directory of Western Appliance Service and Repair Parts.

6 Electrical West Serves the Market

ELECTRICAL WEST has served the electrical industry in the 11 Western States for 68 years. A McGraw-Hill publication, member of ABC and ABP. Circulation (6/30/54):

Utilities	6,096
Contractors	1,212
Wholesalers, Dealers	664
Consultants, Engineers	635
Manufacturers and others	1,825

ELECTRICAL WEST has twice as many utility subscribers in its area as does the leading national publication. It has one or more subscribers in more than 220 wholesale houses. Contractor circulation is concentrated among those employing 4 or more people.

Western electrical developments continuously provide ELECTRICAL WEST'S top-flight editorial staff with outstanding technical articles. This means exclusive articles and "scoops" that assure high readership.

Independent readership surveys consistently show ELECTRICAL WEST equal to or ahead of national magazines in this area.

7 Electrical Advertisers Use Electrical West

Over 250 manufacturers of electrical equipment, apparatus and supplies ran a total of 1236 pages of advertising in ELECTRICAL WEST during 1953. They know that

"It's not hard to sell in the West—
But it's worth Selling hard."

ELECTRICAL WEST

A McGRAW-HILL PUBLICATION

68 POST STREET.....SAN FRANCISCO 4, CALIFORNIA
T. H. CARMODY, R. C. ALCORN

520 NORTH MICHIGAN AVENUE.....CHICAGO 11, ILLINOIS
M. I. O'CONNELL

330 WEST 42ND STREET.....NEW YORK CITY 36, N. Y.
WALTER KLEIN

1111 WILSHIRE BLVD.....LOS ANGELES 17, CALIFORNIA
CARL DYSINGER

PROFESSIONAL SERVICES

Consulting **Management** **Designing** **Inspections**
Accounting **Appraisals** **Testing** **Cost Analysis**
Valuations **Construction** **Financing** **Investigations**

(Continued on following page)

BARKER & WHEELER

Utility and Industrial Valuations, Design and Construction of Power Systems, Water Supplies, Sewerage and Sewage Disposal, Factory Production and Cost Control Systems.

11 Park Place, New York City
36 State Street, Albany, N. Y.

FORD, BACON & DAVIS

Engineers

DESIGN • CONSTRUCTION
VALUATIONS • REPORTS

New York • Chicago • Los Angeles

Peter F. Loftus Corporation

Engineering and Architectural Consultants and Designers

First National Bank Bldg.,
Pittsburgh 22, Pennsylvania
Cable Address—"LOFTUS Pittsburgh"

BLACK & VEATCH

Consulting Engineers

Electricity—Water—Sewage—Industry

Reports, Design, Supervision of Construction, Investigations, Valuation and Rates

4706 Broadway Kansas City 2, Missouri

GILBERT ASSOCIATES, Inc.

Engineers • Consultants • Constructors
Reading, Pa.

Engineering and Design • Construction Supervision
Industrial • Sanitary • Safety
Chemical Laboratory Services
Business and Economic Research
Industrial Relations • Purchasing

New York Philadelphia Washington
Rome Manila Medellin

N. A. LOUGEE & COMPANY

Engineers and Consultants

REPORTS — APPRAISALS
DEPRECIATION STUDIES — RATE CASES
BUSINESS AND ECONOMIC STUDIES

120 Broadway New York

THEODORE D. BROSS & COMPANY

Steel Tower & Wood
Transmission Lines

Distribution & Maintenance

175 Enfield St. Hartford, Conn.

HARZA ENGINEERING CO.

Consulting Engineers

E. MONTFORD FUCIK CALVIN V. DAVIS
Hydroelectric Plants and Dams
Transmission Lines
Flood Control, Irrigation
River Basin Development

400 West Madison Street Chicago 6

LUCAS & LUICK

Engineers

DESIGN, CONSTRUCTION, SUPERVISION, OPERATION, MANAGEMENT, APPRAISALS, INVESTIGATIONS, REPORTS, RATES

231 S. LaSalle St., Chicago

DAY & ZIMMERMAN, INC.

Engineers

Design - Construction - Management
Investigations and Reports

New York Philadelphia Chicago

HOOSIER ENGINEERING COMPANY

Erecting Engineers
Transmission Lines, Substations

1384 Holly Avenue, Columbus, Ohio

LUTZ & MAY

Consulting Engineers

STEAM, GAS & DIESEL POWER STATIONS
PUMPING PLANTS — ELECTRIC SYSTEMS
REPORTS — DESIGN — APPRAISALS

1009 Baltimore Kansas City 6, Mo.

Doble Engineering Company

Electrical Insulation Engineers

Field Testing and Maintenance of High Tension Insulation, Special Problems in Electrical Communications

Office and Laboratory: Doble Park
Box 344, Belmont 78, Mass. (6 miles from Boston)
Branch Office: 20 N. Wacker Dr. Chicago, Ill.

S. E. HUEY & CO.

Engineers & Surveyors

SURVEYS FOR ENGINEERS

Monroe Louisiana

CHAS. T. MAIN, INC.

Engineers

Electric, Steam and Hydraulic Projects, Investigations, Reports, Designs and Appraisals

Chamber of Commerce Building
80 Federal St., Boston 10, Mass.

Ebasco Services Incorporated

Engineers - Constructors - Business Consultants

Design and Construction
Financial and Operating Consultation
Investigations and Reports
Consulting Engineering

Two Rector Street New York
Chicago • Washington, D. C.

JACKSON & MORELAND

Engineers and Consultants

Design and Supervision of Construction
Reports—Examinations—Appraisals
Machine Design—Technical Publications

Boston New York

PIONEER SERVICE & ENGINEERING CO.

Consulting and Design
Engineers . . Purchasing . .
Specialists in Financing
Accounting and Other Operations

221 So. La Salle St. Chicago 4

ELECTRICAL TESTING LABORATORIES, INC.

Electrical, mechanical, photometric, radiometric and chemical laboratories, rendering testing, research and associated services, including certification, inspections at factories and field investigations.

2 East End Avenue at 79th St., New York 21, N. Y.

M. W. KELLOGG

Piping System Design Analyses

Unique piping system model tester as well as modern IBM card programming computer available for low cost, accurate analyses of the most complex piping systems.

The M. W. Kellogg Company,
225 Broadway, New York 7, N. Y.

Recording & Statistical Corp.

BILL ANALYSIS—CONSUMPTION STUDIES

THE ONE-STEP METHOD
(exclusive with R&S)

100 Sixth Ave. WOrth 6-2700 New York 13, N. Y.

ROBERT E. FOLEY CONSTRUCTION CORPORATION

Construction & Maintenance

Transmission—Distribution—Communication Lines
Substation, Radio and Television Towers

48 Griswold St. Binghamton, N. Y.

THE KULJIAN CORPORATION

Engineers - Constructors - Consultants

Power Plant Specialists

Utility - Industrial - Chemical

1200 N. Broad St., Philadelphia 21, Pa.

REIS & CHANDLER, INC.

ADVISORS TO UTILITIES

Financing—Rate of Return

30 Vesey Street, New York 7, N. Y.

PROFESSIONAL SERVICES

(Continued from preceding page)

SANDERSON & PORTER

Engineers and Constructors

New York • Chicago • San Francisco

SARGENT & LUNDY

ENGINEERS

140 South Dearborn St.

Chicago, Ill.

F. W. SCHEIDENHELM

Consulting Engineer

Hydraulic Engineering, Hydro-electric Development, Water Supply, Flood Control, Engineering Problems relating to Water Rights and Water Power Law. Appraisals.

50 Church Street, New York 7, N. Y.

F. A. TUCKER, INC.

Contractors—Engineers specialize in Distribution - Transmission - Telephone lines - Maintenance - Roads - Bridges Dams

Main Office—82½ Center Street, Rutland, Vt.
Branch Office—120 East 3rd St., Charlotte, N. C.

UTILITIES LINE CONSTRUCTION COMPANY, INC.

Construction and Maintenance

Transmission - Distribution
Electric and Telephone Lines
Consultants

505 York Road Jenkintown, Pa.

THE J. G. WHITE ENGINEERING CORPORATION

Design • Construction • Reports • Appraisals

80 Broad Street, New York 4

"By reason of special training, wide experience and tested ability, coupled with professional integrity, the consulting engineer brings to his client detached engineering and economic advice that rises above local limitations and encompasses the availability of all modern developments in the fields where he practices as an expert. His services, which do not replace but supplement and broaden those of regularly employed personnel, are justified on the ground that he saves his client more than he costs him."

SEARCHLIGHT SECTION

Classified Advertising

EMPLOYMENT: BUSINESS: **"OPPORTUNITIES"** :EQUIPMENT :USED OR RESALE

UNDISPLAYED —RATES— DISPLAYED

$1.20 per line, minimum 3 lines. To figure advance payment count 5 average words as a line

POSITION WANTED, undisplayed rate is one-half of above rate, payable in advance.

Box Numbers—Care of publication count as one line

Discount of 10% if full payment is made in advance for 4 consecutive issues

EQUIPMENT WANTED or FOR SALE ADVERTISEMENTS acceptable only in Displayed Style. *Individual Spaces* with border rules for prominent display of advertisements.

The advertising rate is $11.25 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

An advertising inch is measured ⅞" vertically on one column. 3 columns—30 inches—to a page.

SEND NEW ADVERTISEMENTS TO: 330 W. 42 St., N. Y. 36, N. Y., for Nov. 1st issue closing Oct. 22nd

REBUILT AND NEW

GUARANTEED MOTORS

M.G. SETS • GENERATORS

Hoists • Compressors • Transformers

Units of Every Size and Description

SYNCHRONOUS MOTORS
3 Phase, 60 cycle, 220 or 440 volt
(* 2300 volts or higher)

H. P.	Make	Type	Power Factor	Speed
1420	*West.		.7	900
720	*West.		1.0	900
710	*G. E.	ATI	1.0	720
600	*G. E.	TS-7640	1.0	900
500	*G. E.	TS-7657	1.0	514
400	*West.	H	.8	1800
400	West.	HG	1.0	900
300	G. E.	ATI	.8	900
300	G. E.	ATI	.8	720
300	*Ideal	SMM	.8	257
300	G. E.	ATI	.8	1200
250	G. E. (New)	TS-974Y	.8(3 brg)	720
225	G. E.	TS-6244	1.0	300
225	Elec. Mach.		1.0	360
200	Fair-Mor.	TJC-285	.8	720
190	Elec. Mach.		1.0	720
150	Fair-Mor.	TJC-285	.8	720
150	G. E.	ATI	.8	720
150	*Elec. Mach.		.8	1200
150	Westg.	HR	1.0	300
125	*G. E.	TS-7641	1.0	514

WE'LL SELL, BUY OR TRADE
PHONE CANAL 6-2900
CHICAGO *Electric Co.*
1324 W. CERMAK ROAD
CHICAGO 8, ILL.

ELECTRICAL WIRE AND CABLE

—Your Best Source—

- for every industrial and power application
- Odd lengths—long and short—reasonably priced
- **LARGEST STOCK IN MIDWEST**

Let us quote on requirements—
send your inquiries
We'll also buy your Surplus

Branch Offices:
Houston—Yukon 8847 Los Angeles—Angeles 3-5148

UNIVERSAL Wire and Cable Co.
3662 N Clybourn Ave., Chicago 14, Ill.
Estgate 7-4777 Code: UNIWIRE

Sealed bids for furnishing and installing four new generators at Gatun Hydroelectric station, Panama Canal Zone, will be received in the office of the Engineering and Construction Director, Balboa Heights, Canal Zone until 10:00 AM, November 17, 1954 at which time they will be publicly opened. Plans and specifications are available at the office of Procurement Officer, Panama Canal Company, 21 West Street, New York 6, New York. Deposit of $40.00 required.

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42nd St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITIONS VACANT

WANTED: YOUNG, graduate power engineers for utility office and field positions. Contact Electrical engineer, Central Illinois Public Service Company, Springfield, Illinois.

DISTRIBUTION ENGINEER—College graduate with at least ten years active experience in electric public utility distribution system design. Good starting salary. Address: P. O. Box #330, Hartford 15, Connecticut.

EMPLOYMENT SERVICE

SALARIED PERSONNEL, $3,000-$25,000. This confidential service established 1920, is geared to needs of high grade men who seek a change of connection under conditions assuring, if employed, full protection to present position. Send name and address only for details. Personal consultation invited. Jira Thayer Jennings, Dept. L, 241 Orange St., New Haven, Conn.

POSITIONS WANTED

SALES ENGINEER, B.S. & E.E. 30, married, 5 years experience contacting utilities, industrials for switchgear, transformers, rotating machinery, equipments for transmission and distribution. Desires sales or allied position with future East or Midwest. PW-3780, Electrical World.

ELECTRICAL ENGINEER, age 36, 15 years design & specifications commercial, industrial and chemical. Familiar all phases of electrical construction industry. Capable assuming complete charge. Impressive record of completed projects. Desire position with AAA firm or willing to free-lance on part time basis. Any phase considered, drawings, specifications, surveys and/or estimates. Willing to travel. PW-3762, Electrical World.

PRODUCTIVE SALES and Management experience, calling on utilities and distributors; handling distribution and transmission equipment and material. Eight years in Southeastern section; wishes to relocate there, as employee or manufacturers representative. PW-3998, Electrical World.

PROTECTIVE RELAY engineer. Experienced in power system analysis; protective relay applications, settings and testing. PW-4079, Electrical World.

PERIODICALS

A.I.E.E. transactions back-volumes wanted to buy for cash. Ashley 24 E. 21, N.Y.C. (10).

Your Inquiries to Advertisers Will Have Special Value . . .

—for you—the advertiser—and the publisher, if you mention this publication. Advertisers value highly this evidence of the publication you read. Satisfied advertisers enable the publisher to secure more advertisers and—more advertisers mean more information or more products or better service—more value—to YOU.

TRANSFORMERS

FOR SALE

6—1000 KVA Mol 11500-2400/4160Y
3— 833 KVA G-E 35000—480
3— 500 KVA G-E 26400—240/480
5— 333 KVA W-H 38000-7200/12470Y
3— 333 KVA G-E 33000-2300/4000Y/6900/-11950Y
3— 333 KVA G-E 33000-2300/4000Y
3— 333 KVA Mol 7200/12470Y-2500/4160Y
3— 333 KVA W-H 6600-2300
3— 150 KVA G-E 19050/33000Y-2540/4000Y
5— 150 KVA G-E 7200/12470Y-240/480
3— 100 KVA G-E 33000-6900/11950Y
3— 100 KVA G-E 4000-115/230

Many other items in stock

TRANSFORMERS WANTED

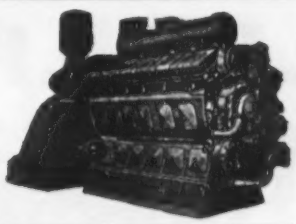
Reliable rewind and repair service on all makes of transformers

THE ELECTRIC SERVICE CO.
Cincinnati 27, Ohio

40 Years Dependable Service

DIESEL POWER

IMMEDIATE SHIPMENT
• PURCHASE OR RENTAL
UNIT CAPACITIES—10 TO 2475 KVA
A.C.—50 AND 60 CYCLES
• ALSO D.C. UNITS



A PARTIAL LISTING OF OUR INVENTORY

KW	Make	Model	HP	RPM	KW	Make	Model	HP	RPM
1150	Worthington	SEH-8	1685	360	320	Superior	60E-6	460	450
1136	Fairbanks Morse	38D	1600	720	300	General Motors	8–268A	450	1200
1100	General Motors	16–278A	1600	720	250	Clark	GD-4	375	360
750	General Motors	12–567	1080	720	200	General Motors	8–268A	350	900
700	Worthington	EE-8	1000	327	175	General Motors	12–71	275	1800
600	General Motors	12–567	860	600	150	Worthington	CC-4	225	450
500	General Motors	8–567	720	720	150	Buckeye	80	240	600
500	Alco	6–12 1x13T	750	600	148	Fairbanks Morse	32E14	220	300
350	Baldwin	VO-6	510	450	100	General Motors	3–268A	150	1200
320	Enterprise	DSG-6	460	450	60	General Motors	6–71	90	1200

A. G. SCHOONMAKER COMPANY, INC.
DIESEL DIVISION, 50 CHURCH ST., NEW YORK 7, N. Y.

J. L. HEMPHILL & CO.

ELECTRICAL ENGINEERS & EQUIPMENT

1606 53rd ST. NORTH BERGEN N. J. N.Y.C. Tel. LOngacre 5-3227 N.J. Tel. UNion 3-7600

TRANSFORMERS 60 CYCLE

2—3750 KVA G.E.—3 ph. (new) type OA outdoor 26,400 V., pri. 4360 V. sec.
1— 750 KVA G.E. type HT, 3/60, 4150-230V.
2— 750 KVA, G.E., type H, 1 Ph., 4150-230V.
3— 100 KVA, Wagner, 1 Ph., 460-115/230V.
3— 50 KVA G.E., Type H, 460, X115/230.
3— 50 KVA Whse. New. OISC, 2400/4160Y. X240/480.
3—37½—KVA G.E., Type H, 2400/4160, X 120/240.

SYNCHRONOUS MOTORS

1— 300 H.P., Elec. Mach., 720 RPM, 3 Phase 60 cyc., 2200V T E F Cooled Outdoor service.
1— 150 H.P., G.E., 1800 RPM. 220V. 3/60.
2— 150 H.P., Al. Chal 360 RPM. 440V. 3/60.

MOTOR GENERATOR SETS

1—1000 KW Whse., 600 V. 720 RPM, 4150 syn.
1—1000 KW G.E., 600 V. 514 RPM 4000 Syn.
1— 750 KW Whse., 275 V. 720 RPM. 4000 Syn. 300 G.E. 250 V. 1200 rpm. S.R.
1— 200 KW Whse., 250 V. 900 RPM. 4000V. Syn.
1— 150 KW G.E., 126/250V. 1200 RPM 2300 Syn.

SLIP RING MOTORS

2— 500 H.P., G.E., M 1200 RPM 2400V.
1— 400 H.P., West., CW. 450 RPM. 550V.
1— 250 H.P. West., CW. 600 RPM. 440V.
1— 200 H.P., West., CW. 600 RPM. 440V.
3— 150 HP., Al. Ch. 1800 RPM. 2300V., 3 PH. 60 Cy.

Large Stock of A.C. and D.C. Equipment

NEW CONTACTORS

¼ and less of list price

Allen-Bradley Bulletin 702, Size 1, 4-pole enclosed, also 3-pole enclosed and 3-pole not enclosed electrically held contactors, 110 volt 60 cycle holding coils.

Cheek Manufacturing Company
Box 791, Hearne, Texas.

OPPORTUNITIES!

in

New and used equipment recently released from service by a number of electric and gas utility companies

POWER PLANT EQUIPMENT
CONSTRUCTION EQUIPMENT
SUBSTATION EQUIPMENT
TRANSMISSION LINE MATERIALS

Send for new list, . . . to

EBASCO SERVICES INCORPORATED
(APPARATUS EXCHANGE)
Two Rector St., New York 6, N. Y.

SUBSTATION EQUIPMENT

TRANSFORMERS

QU.	KVA	MFR.	VOLTAGE
1	10000	A. C.	66000—33000, 3 ph.
4	2500	Mol.	66000—13800
4	500	West.	69000—6900
3	400	G. E.	66000/33000—2300/4160
3	333	Stand.	69000/34500—7200/12470 Y
3	200	Pitts.	66000—2300
3	1500	Wag.	44000—6900
3	1250	A. C.	44000/11500—460
4	150	West.	44000/33000—2300/6900
3	75	West.	44000—7200/12470 Y
3	5000	G. E.	38100/66000—6600
1	3750	Penna.	38030/65865 Y—13800, 3 ph.
4	3333	G. E.	38100/66000 Y—33000
4	3125	Mol.	39900/66000 Y—26600/46000 Y
6	2000	Mol.	38100/66000 Y—13800
4	4500	G. E.	36000—13300—2400
1	5000	West.	34500—13750, 3 ph.
3	3333	G. E.	33000/11000—2400/7200
4	333	G. E.	34500—13800/23900 Y
3	200	A. C.	34500—2400/7200/12470 Y
3	75	Wag.	33000—240/480
3	1250	G. E.	26400/13200—2400
4	1500	A. C.	25400/44000 Y—6900/13800
4	450	A. C.	25410/44000 Y—13200/23000
3	100	G. E.	22000—7200/12470 Y
1	2000	G. E.	13800—2300, 3 ph.
3	667	G. E.	13800—2300
1	600	Stand.	13200—2300, 3 ph.
1	450	Penna.	13200—2400, 3 ph. ASKAREL
6	200	G. E.	13200—230/460
4	167	G. E.	7200/12470 Y—2400
3	125	A. C.	6900—2300
3	37½	G. E.	6900—230/460
4	150	G. E.	4800/2400—240/120
2	100	G. E.	4800/2400—240/480
1	3000	G. E.	4160—480/277 PYRANOL
3	333	G. E.	2400/4160 Y—460
3	250	G. E.	2300/4000 Y—115/230
3	200	West.	2400—240/480
3	150	West.	2400—230/115
3	150	West.	2400/4160 Y—240/480
1	100	G. E.	2300—575, 3 ph.
6	50	West.	2400—114/228 DRY TYPE
1	50	G. E.	2400/4160 Y—240/480, 3 ph.

ALSO— FREQUENCY CHANGERS
MOTOR GENERATOR SETS
SYNCH. CONDENSERS
OIL CIRCUIT BREAKERS
FEEDER REGULATORS, etc.

BREW, WOLTMAN & CO., INC.
52 Church St. New York 7, N. Y.

RE-NU-BUILT
GUARANTEED

ELECTRIC POWER EQUIPMENT

MOTOR GENERATOR SETS

3 ph., 60 cy.

Qu.	KW	Make	Speed	DC Volts	DC Volts
1	3000 3U	G.E.	514	600	4000/13200
2	2000/2400	G.E.	450	250/300	2300/4600
2	2000	G.E.	514	600	6600/13200
1	2000	G.E.	500	666 25 cy.	11000
2	2000	G.E.	450	600	2300/4600
1	1500	C.W.	514	115	4000/13800
1	1500	G.E.	720	600	13200
1	1000	G.E.	900	250	4100/6900
3	1000	G.E.	720	600	2300/4600
2	750	G.E.	720	275	2300/4600
1	500	Whse.	1200	125/250	2300
1	500	Whse.	900	250	440
1	500	G.E.	720	125	2300

TURBO GENERATORS

Qu.	KW	Make	Desc.
1	4000	G.E.	Condensing—425 lbs—750° F.T.T.—Surface Condenser 3/60/2300—4000 v with exciter
1	1000	G.E.	Non-Cond—190 lbs–2400–3–60
1	1000	Moore	Condensing—Extraction—190 lbs., 2400–3–60—Surface Cond.
1	750	G.E.	Condensing—265 lbs., 440–3–60 Built 1944
1	500	Moore	Non-Cond—150/200 lbs., 5/35 lbs. B.P., 480–3–60 Dir. Conn Exciter.
1	300	G.E.	Non-Cond—150/175 lbs., 5/10 lbs. B. P., 480–3–60

FREQUENCY CHANGERS

Qu.	Kva	Make	Cycles	Voltages
1	13900	Whse.	60/25	13200 x 13200
1	2750	G.E.	60/25	4150/2400 x 2400/4150
1	3125	G.E.	25/60	4150/2400 x 2400/4150
2	2500	G.E.	25/62½	2300 x 4160
1	1250	G.E.	25/58.3	4400 x 2300
1	625	A.C.	25/60	11000 x 2300

TRANSFORMERS—60 Cycle

KVA	Make	Type	Ph	Voltages
1—5000	Whse.	OISC	3	33000x26400/13200
1—2500	Whse.	OISC	3	26400/13200 x 480
3—2000	G.E.	HVDDJ	1	66000 x 13800
2—667	G.E.	HD	1	13800 x 2300
3—1250	G.E.	HVDDJ		6600/550
3—1000	G.E.	HVDDJ	1	2200/480

BELYEA COMPANY, INC.
51 Howell Street, Jersey City 6, N. Y.

WORLD'S LARGEST INVENTORY

FREE CATALOG

MOTORS–GENERATORS–TRANSFORMERS
New and Guaranteed Rebuilt
1 H.P. to 2500 H.P.

ELECTRIC EQUIPMENT CO.
P. O. BOX 51, ROCHESTER 1, N.Y.

LIFE LINES

Lifelines of Priceless Service...the Breeches Buoy...the Electrical Underground Cables!

Public utilities, municipalities and electrical contractors everywhere rely on ORANGEBURG FIBRE CONDUIT to protect their lifelines — keep them healthy and long-lived.

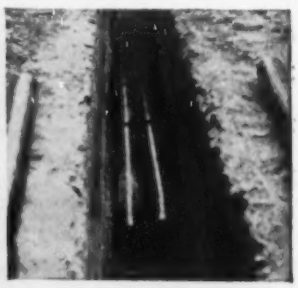
The Many Advantages of Using Orangeburg Fibre Conduit

- It is non-metallic — no corrosion.
- Its impermeable wall and tight joints keep the ground waters out.
- Its smooth bore and low coefficient of friction safeguard the cable sheaths from abrasion — when pulled in — and later from cable movement.
- Orangeburg is strong and tough — *gives* without breaking.
- Service records go back 61 years.

ORANGEBURG with its long lightweight lengths, easily assembled joints, angle couplings, bends, and other standard fittings, simplifies installations.

For complete cable protection at lowest possible cost be sure to specify Orangeburg Fibre Conduit. For more complete information send to Dept. EW104.

ORANGEBURG MANUFACTURING CO., INC.
ORANGEBURG, NEW YORK
West Coast Plant, Newark, Calif.



ORANGEBURG FIBRE CONDUIT

STANDARD with concrete encasement **NOCRETE** without concrete encasement

GENERAL ELECTRIC SUPPLY COMPANY
A Division of General Electric Distributing Corporation

DISTRIBUTORS, ORANGEBURG FIBRE CONDUIT
BRANCHES AND STOCKS IN PRINCIPAL CITIES

GraybaR ELECTRIC COMPANY

New Style Shipping Crate Cuts Transformer Warehousing Costs

CRATE BOTTOM is a re-usable pallet. After transformer is uncrated you can remove pallet and use it for handling other materials.

CRATED DISTRIBUTION TRANSFORMERS can be moved fast and efficiently with Allis-Chalmers new style shipping crate. With the new crate, it is easier to move transformers with a fork truck because the crate bottom is a pallet to permit easy loading.

Stacking is easier too. Side bracing distributes loads so effectively that it is no longer necessary to use wooden runners between layers of stacked crates. Crates are built of quality lumber. The tops and bottoms key with the tops and bottoms of adjacent crates. Crates can be stacked higher and more safely than ever before.

Local Stocks Available

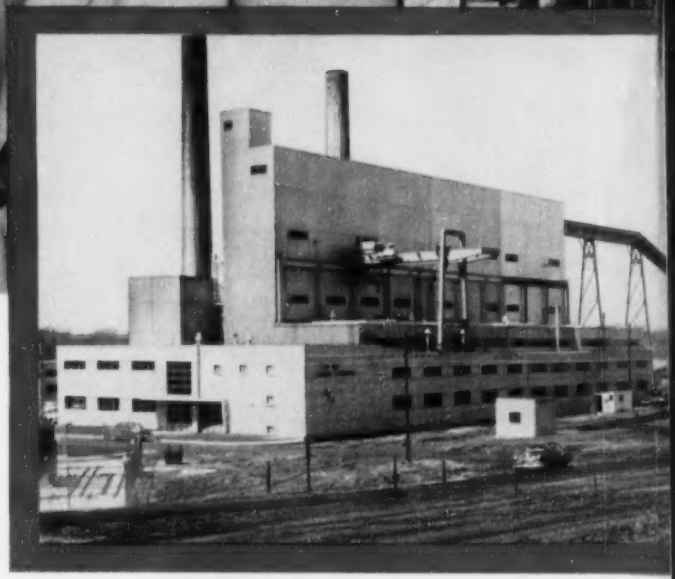
Allis-Chalmers maintains local stocks of conventional distribution transformers as well as self-protecting and overload indicating types. All are available in most popular ratings. These stocks, in addition to your own transformer supply, assure a solution to your distribution transformer problem when you need it — where you need it.

Take stock of your transformer needs today. To get more facts on availability and ease of handling of Allis-Chalmers distribution transformers, contact your local A-C office or distributor or write Allis-Chalmers, Milwaukee 1, Wisconsin.

A-4425

ALLIS-CHALMERS

On-the-spot help and advice is part of the job for every Standard Oil lubrication specialist. Here Chief Operator G. C. Barlow and Standard's R. R. Spargo examine color and clarity of NONPAREIL during regular periodic check-up.



"We picked the only oil with a turbine life-time guarantee!"

NONPAREIL
TRADE MARK
Turbine Oil

STANDARD

■ "When our new Power Plant was planned, your turbine oil guarantee impressed all concerned at the Corn Belt Power Cooperative at Humboldt, Iowa," says Chief Operator G. C. Barlow. "Only Standard offered a guarantee on turbine oil for the life of the turbine—so we chose Standard's NONPAREIL Turbine Oil—and we've been completely satisfied since."

Specifically, Standard guarantees that the acidity of NONPAREIL Turbine Oil will never exceed a neutralization number of 0.15 KOH/gm. This means an absence of sludge and deposits in governors and filters. The whole system stays clean. The oil never needs to be removed for treating or cleaning.

Corn Belt's first three turbines were initially filled with NONPAREIL Turbine Oil in 1950 and 1951. Since then periodic checks have shown that the neutralization number has never exceeded 0.04 KOH/gm. The turbines have operated perfectly without *any* cleaning or changing of oil. Naturally, when a fourth turbine was recently added it too was filled with NONPAREIL.

NONPAREIL has been making records like this in turbines large and small for more than 25 years. For this kind of guaranteed superior lubrication in *your* plant's turbines—new or old—fill with NONPAREIL. A Standard Oil lubrication specialist will be happy to show you the facts and data on NONPAREIL's history in installations similar to yours. Call your nearest Standard Oil office or write: Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

STANDARD OIL COMPANY (*Indiana*)